



N-terminal domain truncated telomerase

ATGCCGCGCGCTCCCCGCTGCCGAGCCGTGCGCTCCCTGCTGCGCAGCCACTACCGCGAGGTGCTGCCGCTGGCCACGTTCGTG
M P R A P R C R A V R S L L R S H Y R E V L P L A T F V

CGGCGCTGGGGCCCCAGGGCTGGCGGCTGGTGACGCGGGGACCCGGCGGCTTTCGCGCGCTGGTGGCCAGTGCCTGGTGTGCGTGCCCTGGGACGACGGCCGCCCCCGCGCG
R R L G P Q G W R L V Q R G D P A A F R A L V A Q C L V C V P W D A R P P P A A

CCCTCTTCGCGCAGGTGTCTGCTGAAGGAGCTGGTGGCCGAGTGTGTCAGAGGCTGTGCGAGCGCGCGCGGAAGAACGTGTGGCTTCGGCTTCGCGCTGCTGGACGGGGCCCG
P S F R Q V S C L K E L V A R V L Q R L C E R G A K N V L A F G F A L L D G A R

CGGGGGCCCCCGAGGCTTACCAACAGCGTGGCGAGCTACTGCCCCAACCGTGACCGACGACTGCGGGGAGCGGGCGTGGGGCTGCTGCTGCGCGCGTGGCGACGAGCT
G G P P E A F T T S V R S Y L P N T V T D A L R G S G A W G L L L R R V G D D V

GCTGGTTCACCTGCTGGCAGCTGCGCGCTCTTTGTGTGGTGGCTCCGAGCTGCGCTTACAGGTGTGCGGGCGCGCGCTGTACAGCTCGGCGCTGCCACTCAGGCGCGGGCCCCCGC
L V H L L A R C A L F V L V A P S C A Y Q V C G P P L Y Q L G A A T Q A R P P P

ACACGCTAGTGGACCCCGAAGGCTCTGGGATGCGAACGGGCTGGAACATAGCGTCAGGAGGGCGGGGTCCCGCTGGGCTGCCAGCCCCGGGTGCGAGGAGCGCGGGGCGAGTGC
H A S G P R R R L G C E R A W N H S V R E A G V P L G L P A P G A R R R G G S A

CAGCGAAGTCTGCGTGGCCAGAGGGCCAGGCGTGGCGCTGCCCCGAGCGGAGCGGACGCGGTGGGCGAGGGTCTGGGCGCACCCGGGCGAGGACGCGTGGACCGAGTGACCG
S R S L P L P K R P R R G A A P E P E R T P V G Q G S W A H P G R T R G P S D R

TGGTTTCTGTGTGTGTGACCTGCCAGACCCCGCAAGAAGCCACCTCTTTGGAGGGTGGCTCTCTGGCACGCGCCACTCCACCCATCCGTGGGCGCGCAGCACCAGCGGGCCCCCG
G F C V V S P A R P A E E A T S L E G A L S G T R H S H P S V G R Q H H A G P P

ATCCACATGCGGGCCACACGCTCCCTGGGACACGCTTGTCCCCGGTGTACGCGGAGACCAAGCACTTCTCTACTCTCAGGCGACAAGGAGCAGCTGCGGCGCTCTCTCTACTCAG
S T S R P P R P W D T P C P P V Y A E T K H F L Y S S G D K E Q L R P S F L L S

CTCTCTGAGGCGCAGCTGACTGGCGCTGGGAGGCTCGTGGAGACCATCTTTCTGGGTTCCAGGCGCTGGATGCCAGGGACTCCCGCAGGTTGCCCCGCTGCCCGAGCGCTACTGGCA
S L R P S L T G A R R R L V E T I F L G S R P W M P G T P R R L P R L P Q R Y W Q

AATCGGCCCCCTGTTTCTGGAGCTGTCTGGGAACACGCGCAGTGCCCTACGGGGTGTCTCTCAAGACGCACTGCCCGCTGCGAGCTGCGGTCACCCCAGCAGCGGTGTCTGTGCCCCG
M R P L P L E L L G N H A Q C P Y G V L L K T H C P L R A A V T P A A G V C A R

GGAGAAGCCCCAGGGCTCTGTGGCGGCCCCGAGGAGGAGGACACAGACCCCGTGGCTGGTGGAGCTGCTCCGCGACACAGCAGCCCCCTGGCAGGTGTACGGCTTCTGTGCGGGCCTG
E K P Q G S V A A P E E E D T D P R R L V Q L L R Q H S S P W Q V Y G F V R A C

CCTGCGCGGCTGGTGGCCCCAGGCTCTGGGGCTCCAGGCACAACGAACGCGCTTCTCAGGAACACCAAGATTCTCTCCCTGGGGAAGCATGCCAAGCTCTGCTGCAGGAGCT
L R R L V P P G L W G S R H N E R R F L R N T K K F I S L G K H A K L S L Q E L

GAGTGGGAAGATGAGCGTGGGACTGCGCTTGGCTGCGCAGGAGCCAGGGTGGCTGTGTTCGGCGCGCAGAGCACCGTCTGCGTGAGGAGATCTGGCCAAAGTTCTGCACTGGCT
T W K M S V R D C A W L R R S P G V G C V P A A E H R L R E E I L A K F L H W L

GATGAGTGTGTACGTGCTGAGCTGCTCAGGTCTTTCTTTATGTACGAGAGCCAGCTTTCAAAGAAGAGCTCTTTTCTACCGGAAGAGTGTCTGGAGCAAGTTGCAAAGCATTTGG
M S V Y V V E L L R S F F Y V T E T T F Q K N R L F P Y R K S V W S K L Q S I G

AAT - NNN - GACAGTCAACAGGGGGTTGACCGCGGACTGGGCGTCCCCAGGGTGACTATAGGACCAGGTGTCCAGGTGCCCTGCAAGTAGAGGGGCTCTCAGAGGCGTGTGGCTGG
CATGGGTGGACGTGGCCCCGGGACATGGCTTCTGCGTGTGCTGCGGTGGGTGCCCTGAGCCCTCACTGAGTGGTGGGGCTTGTGGCTTCCCGTGAGCTTCCCGCTAGTCTGTGTCTG
GCTGAGCAAGCTCTGAGGGGCTCTCTATTG-

FIG. 11A



Truncated protein 1

ATGCCGCGGCTCCCGCTGCCGAGCCGTGCGCTCCCTGCTGCGCAGCCACTACCGCGAGGTGCTGCCGCTGGCCACGTTCGTG
M P R A P R C R A V R S L L R S H Y R E V L P L A T F V

CGGCGCTGGGGCCCCAGGGCTGGCGGCTGGTGCAGCGCGGGACCCGGCGGCTTTCCGCGGCTGGTGGCCAGTGCCTGGTGTGGTGCCCTGGGACGCAAGCGCGCCCCCGCGC
R R L G P Q G W R L V Q R G D P A A F R A L V A Q C L V C V P W D A R P P P A A

CCCCCTCTTCGCCAGGTGTCTGCTGAAGGAGCTGGTGGCCGAGTGTGTCAGAGGCTGTGCGAGCGCGCGAAGAACGTGCTGGCTTCGGCTTCGCGCTGCTGACGGGGCCCG
P S F R Q V S C L K E L V A R V L Q R L C E R G A K N V L A F G F A L L D G A R

CGGGGGCCCCCGAGGCTTACCACACAGCGTGCAGCTACCTGCCCAACACGSGTACGACGCACTGCGGGGAGCGGGGCGTGGGGGCTGCTGCTGCGCGCGTGGGCGACGAGT
G G P P E A F T T S V R S Y L P N T V T D A L R G S G A W G L L L R R V G D D V

GCTGTTTCACTGTGCGCAGCTGCGGCTCTTTGCTGCTGGTCTCCAGTGTGCGCTACAGGTGTGCGGGCGCGCGTGTACAGCTGCGGCTGCGCACTCAGGCCCGGGCCCCCGC
L V H L L A R C A L F V L V A P S C A Y Q V C G P P L Y Q L G A A T Q A R P P P

ACACGCTAGTGGACCCGAGGCGTGTGGATGCGAAGCGGCTGGAACCATAGCGTCAGGAGGCGGGGTCCCCCTGGGCTGCGAGCCCGGGTGGAGGAGCGGGGGCAGTGC
H A S G P R R L G C E R A W N H S V R E A G V P L G L P A P G A R R R V G G S A

CAGCGAAGTGTGCGTTCGCAAGAGGCCAGGCGTGGCGCTGAGCGGAGCGGACCGCGTGGGCGAGGGTCTGGGCCACCCGGGCGAGACGCTGGACCGAGTACCG
S R S L P L P K R P R R G A A P E P E R T P V G Q G S W A H P G R T R G P S D R

TGGTTTCTGTGTGTGTCTACCTGCCAGACCCCGAAGACCATCTTTTGGAGGTGCGCTCTCTGCGACGCGCACTCCACCCATCCGTGGGCGCCAGCACACGCGGCCCCC
G F C V V S P A R P A E E A T S L E G A L S G T R H S H P S V G R Q H H A G P P

ATCCACATCGCGGCCACCGCTCCCTGGGACACGCTTGTCCCCCGGTGTACGCGAGACCAAGCACTTCTCTACTCTCAGGCGACAAGGAGCAGCTGCGGCGCTCTCTCTACTCAG
S T S R P P R P W D T P C P P V Y A E T K H F L Y S S G D K E Q L R P S F L L S

CTCTCTGAGGCCAGCCTGACTGGCGCTCGGAGGCTCGTGGAGACCATCTTTCTGGGTTCAGGCCCTGGATGCCAGGACTCCCGCAGGTTCGCCCCGCTGCCCGACGCTACTGGCA
S L R P S L T G A R R L V E T I F L G S R P W M P G T P R R L P R L P Q R Y W Q

AATGCGGCCCTGTCTTCTGGAGTGTCTGGGAACACGCGCAGTGCCTTACGGGTGCTCTCAAGACGCACTGCCGCTGCGAGCTGCGGTACCCAGCAGCGGGTGTCTGTGCGCG
M R P L F L E L L G N H A Q C P Y G V L L K T H C P L R A A V T P A A G V C A R

GGAGAAGCCCCAGGCTCTGTGGCGGCCCGGAGGAGGACACAGACCCCGTGCCTGGTGCAGCTGCTCCGCGAGCACAGCAGCCCTGGCAGGTGTACGGCTTGTGCGGGCTG
E K P Q G S V A A P E E E D T D P R R L V Q L L R Q H S S P W Q V Y G F V R A C

CCTGCGCGGCTGTGCCCCAGGCTCTGGGGCTCCAGGCACAACGAAACGCGCTTCTCAGGAACACCAAGAAGTTCATCTCCCTGGGAAGCATGCCAAGCTCTGCTGAGGAGCT
L R R L V P P G L W G S R H N E R R F L R N T K K F I S L G K H A K L S L Q E L

GACGTGGAAGATGAGCGTGGGGACTGCGCTTGGTGCAGGAGCCAGGGGTGGCTGTGTTCCGCGCGCAGAGCACCGTCTGCGTGAGGAGATCTGGCCAAAGTTCCTGCACTGGCT
T W K M S V R D C A W L R R S P G V G C V P A A E H R L R E E I L A K F L H W L

GATGAGTGTGTACGTGCTGAGCTGCTCAGGTCTTTCTTTATGTACGGAGACACGTTTCAAAAGAACAGGCTCTTTTCTACCGGAAGAGTGTCTGGAGCAAGTTCAAAGCATTGG
M S V Y V V E L L R S F F Y V T E T T F Q K N R L F F Y R K S V W S K L Q S I G

AATCAGACGCACTTGAAGAGGGTGCAGCTGCGGGAGCTGTGGAAGCAGAGGTGAGGAGCATCGGGAAGCCAGGCCCGCTGCTGACGTCCAGACTCCGCTTCAATCCCAAGCCTGA
I R Q H L K R V Q L R E L S E A E V R Q H R E A R P A L L T S R L R F I P K P D

GTGGCTGTGCTTTGGTTTAACTTCCCTTTTAAACAGAA
V A V L W F T F L P N Q K

CGGGCTGCGGCCGATTGTGAACATGGACTACGTGCTGGAGCCAGAACGTTCCGAGAGAAAAGAGGGCCGAGCGTCTCACCTCGAGGGTGAAGGCACTGTTTCAGCGTCTCAACTACGA
G L R P I V N M D Y V V G A R T F R R E K R P S V S F R G *

FIG. 11B



Truncated protein 2

ATGCGCGCGCTCCCGCTGCGGAGCCGTGCGCTCCCTGCTGCGCAGCCACTACCGCGAGGTGCTGCGCTGGCCACGTTCTG
M P R A P R C R A V R S L L R S H Y R E V L P L A T F V

CGGCGCTGGGGCCCGAGGCTGGCGCTGTGTGACGCGCGGGACCCGGCGGCTTTTCGCGCGCTGGTGCCAGTGCTGGTGTGCTGCGCTGGGACGCGACGGCGCGCCCGCGCGC
R R L G P Q G W R L V Q R G D P A A F R A L V A Q C L V C V P W D A R P P P A A

CCCCCTCCTTCGCCAGGTGTCTGCTGAAGGAGCTGTGGCGCGAGTGCTGCGAGGCTGTGCGAGCGCGCGCGAAGAACGTGCTGGCCTTCGGCTTCGCGCTGTGGACGGGGCCCG
P S F R Q V S C L K E L V A R V L Q R L C E R G A K N V L A F G F A L L D G A R

CGGGGCCCCCGAGGCTTCAACACGCGTGGCAGCTACCTGCCAACACGCTGACGACGACTGCGGGGAGCGGGCGTGGGGCTGCTGCTGCGCGCGTGGGCGACGACGT
G G P P E A F T T S V R S Y L P N T V T D A L R G S G A W G L L L R R V G D D V

GCTGGTTCACCTGCTGGCAGCTGCGCGCTCTTTGTGCTGGTGGCTCCAGCTGCGCGCTACAGGTGTGCGGGCGCGCTGTACAGCTGCGCGCTGCGACTCAGGCGCGCGCGCGC
L V H L L A R C A L F V L V A P S C A Y Q V C G P P L Y Q L G A A T Q A R P P P

ACAGCTAGTGGACCCGAGGCGTCTGGGATGCGAACCGGCTGGAACATAGCGTACGGAGGCGCGGGTCCCTTGGGCTGCGACCCCGGGTGGAGGAGCGCGGGGCGAGTGC
H A S G P R R R L G C E R A W N H S V R E A G V P L G L P A P G A R R R G G S A

CAGCGAAGTCTGCGTGTGCCAAGAGGCCAGCGTGGCGCTGCCCTGAGCGGAGCGGACCGCGTGGGCGAGGGTCTGGGCGCACCGCGGAGGACGCTGGACCGAGTGACG
S R S L P L P K R P R R G A A P E P E R T P V G Q G S W A H P G R T R G P S D R

TGGTTTCTGTGTGTGCTACCTGCGCAGACCCCGAAGCCACCTCTTTGGAGGTGCGCTCTGCGCAGCGCGCTCCACCCATCCGTGGGCGCGCGACGACCGCGCGCGCGC
G F C V S L P A R P A E E A T S L E G A L S G T R H S H P S V G R Q H H A G P P

ATCCACATCGCGCGCACCGCTCCCTGGGACACGCTTGTCCCGCGGTGACCGGAGACCAAGCACTTCTCTACTCTCAGGCGACAGGAGCAGCTGCGCGCTCTCTCTACTCAG
S T S R P P R P W D T P C P P V Y A E T K H F L Y S S G D K E Q L R P S F L L S

CTCTCTGAGCGCGCTGCTGCGCTGGGAGCTCGTGGAGACCATTTCTGGGTTCAGGCGCTGGATGCGAGGACTCCCGCAGGTGTGCCCGCGCTGCCCGACGCTACTGGCA
S L R P S L T G A R R L V E T I F L G S R P W M P G T P R R L P R L P Q R Y W Q

AATGCGCGCTGTCTTCTGAGCTGTCTGGGAACACGCGCAGTGCCTTACGGGTGCTCTCAAGAGCAGCTGCGCGCTGCGAGCTGCGGTCAACCGCAGCGCGGTGTCTGTGCGG
M R P L F L E L L G N H A Q C P Y G V L L K T H C P L R A A V T P A A G V C A R

GGAGAAGCCCGAGGCTCTGTGCGCGCGCGGAGGAGGACACAGACCCCGCTGCGCTGTGCTGCTGCTGCGCAGCAGCAGCCCTGCGAGGTGTACGGCTTGTGCGGGCGCT
E K P Q G S V A A P E E E D T D P R R L V Q L L R Q H S S P W Q V Y G F V R A C

CCTGCGCGGCTGTGCGCGCGCGCTCTGGGCTCCAGGCACAAAGCGCGCTTCTCAGGAACACCAAGAGTTCATCTCCCTGGGAGCAGTCCAAAGCTCTCCTGCTCAGGAGCT
L R R L V P P G L W G S R H N E R R F L R N T K K F I S L G K H A P R L P Q R Y W Q

GACGTGGAAGATGAGCGTGGCGCTGCGCTTGGCTGCGCAGGAGCCAGGGGTGCGTGTGTTCCGCGCGCAGAGCACCGTCTGCGTGAGGAGATCTGGCCAAGTTCCTGCACTGGCT
T W K M S V R D C A W L R R S P G V G C V P A A E H R L R E E I L A K F L H W L

GATGAGTGTGTACGTCGTCGAGCTGCTCAGGTCTTTCTTTATGTACCGAGACCACTTTCAAAAGAACAGGCTCTTTTCTACCGAAGAGTGTCTGGAGCAAGTGTCAAAGCATTTGG
M S V Y V V E L L R S F F Y V T E T T F Q K N R L F F Y R K S V W S K L Q S I G

AATCAGACGCACTTGAAGAGGTGCGAGCTGCGGAGCTGTGCGAAGCAGAGGTGAGGAGCATCGGGAAGCAGGCGCGCGCTGCTGAGCTCCAGACTCCGCTTCACTCCCAAGCGCTGA
I R Q H L K R V Q L R E L S E A E V R Q H R E A R P A L L T S R L R F I P K P D

CGGGCTGCGCGCGATGTGAACATGGACTACGTCGTGGGAGCCAGAACGTTCCGAGAGAAAGAGGCGCGAGCTTCACTCGAGGGTGAAGCACTGTTTACGCGTGTCAACTACGA
G L R P I V N M D Y V V G A R T F R R E K R A E R L T S R V K A L F S V L N Y E

GCGGGCGCGCGCGCGCGCTCTGCGCGCGCTCTGTGCTGGGCTGGACGATATCCACAGGCGCTGGCGCACCTTCTGCTGCGTGTGCGGGCCAGGACCCGCGCGCTGAGCTGTACTT
R A R R P G L L G A S V L G L D I H R A W R T F V L R V R A Q D P P P E L Y F

TGTCAAGTGGATGTGACGGGCGGTACGACACCATCCCCAGGACAGGCTCAGGAGGTATCGCCAGCATCATCAAAACCCAGAACAGTACTGCGTGGCTGGTATGCGGTGTTCCA
V K V D V T G A Y D T I P Q D R L T E V I A S I I K P Q N T Y C V R R Y A V V Q

GAAGCGCGCCATGGGCACTGCGCAAGGCTTCAAGAGCCAC
K A A H G H V R K A F K S H

GTCTACGTCCAGTG
V L R P V

CCAGGGATCCCGCAGGCTCCATCTCTCCAGCTGCTGCGAGCTGTGCTACGCGACATGGAGAACAAGCTGTTTGGGGGATTGCGGGGAGCGGGCTGCTCTGCGTTTGGTGA
P G D P A G L H P L H A A L Q P V L R R H G E Q A V C G D S A G R A A P A F G G

TGATTTCTGTGTGTGACACCTCACCTCACCCAGCGAAACCTTCTCAGGACCTGTGTCGAGGTGTCCTGAGTATGGCTGCGTGGTGAACCTGCGGAAGACAGTGGTGAACCTTCC

FIG. 11C

Truncated protein 3

Altered C-terminus protein



Truncated protein that lacks motif A

ATGCCGCGCGCTCCCCGCTGCCGAGCCGTGCGCTCCCTGCTGCGCAGCCACTACCGCGAGGTGCTGCCGCTGGCCACGTTCTGTG
M P R A P R C R A V R S L L R S H Y R E V L P L A T F V

CGGCGCCTGGGGCCCCAGGGCTGGCGGCTGTGACGCGCGGGGACCCGGCGGCTTCCGCGCGCTGGTGGCCAGTGCTGGTGTGCGTGGCCCTGGGACGCGACGGCCGCCCCCGCCG
R R L G P Q G W R L V Q R G D P A A F R A L V A Q C L V C V P W D A R P P P A A

CCCTCCTTCCCGCAGGTGTCTGCCTGAAGAGCTGTGGCCCGAGTGTGACAGAGGCTGTGCGAGCGCGGGCGGAAGACGTGCTGGGCTTCCGCGCTGTGACGCGGGCCCCG
P S F R Q V S C L K E L V A R V L Q R L C E R G A K N V L A F G F A L L D G A R

CGGGGCCCCCGAGGCTTACCACCGCGTGGCGAGCTACCTGCCAACACCGTGTACCGACGCACTGCGGGGAGCGGGGCTGGGGGCTGCTGCTGCCGCCGCTGGGCGACGAGCT
G G P P E A F T T S V R S Y L P N T V T D A L R G S G A W G L L L R R V G D D V

GCTGGTTCACCTGTGCGACGCTGCGCGCTCTTTGTGCTGGTGGCTCCAGCTGCGCCTACCGGTGTGCGGGCGCGCGCTGTACAGCTCGGGCTGCGCACTCAGGCCCGGCCCCCGCC
L V H L L A R C A L F V L V A P S C A Y Q V C G P P L Y Q L G A A T Q A R P P P

ACACGCTAGTGGACCCGAAGGCGTCTGGGATGCGAACGGGCTGGAACCATAGCGTCAGGGAGGCGGGGTCCCTGGGCTGCCAGCCCCGGGTGCGAGGAGCGGGGGCAGTGC
H A S G P R R R L G C E R A W N H S V R E A G V P L G L P A P G A R R R G G S A

CAGCCGAAGTCTGCGCTGCCAAGAGGCGCCAGGCTGGCGCTGCCCTGAGCCGAGCGGACGCCGCTGGGCGAGGGTCTGGGCCACCCGGGCGAGGACGCTGGACCGAGTGACCG
S R S L P L P K R P R R G A A P E P E R T P V G Q G S W A H P G R T R G P S D R

TGGTTTCTGTGTGTGTACCTGCCAGACCCCGAAGAACCTCTTTGGAGGGTGGCTCTCTGGCAGCGCCACTCCACCCATCCGTTGGGCGCCAGCAGCAGCGGGCCCCCG
G F C V V S P A R P A E E A T S L E G A L S G T R H S H P S V G R Q H H A G P P

ATCCACATCGCGGCCACCGCTCCCTGGGACACGCTTGTCCCCCGGTGTACCGGAGACCAAGCACTTCTCTACTCTCAGCGGACAGGAGCAGCTGCCGCCCTCTCTCTACTCAG
S T S R P P R P W D T P C P P V Y A E T K H F L Y S S G D K E Q L R P S F L L S

CTCTCTGAGGCCAGCCTGACTGGCGCTCGGAGGCTCGTGGAGACCATCTTTCTGGGTTCAGGCGCTGGATGCCAGGAGTCCCGCGAGGTTGCCCGGCTGCCCGCCGCTACTGGCA
S L R P S L T G A R R L V E T I F L G S R W M P G T P R R L P R R L P R Y W C

AATGCGGCCCTGTCTTCTGAGCTGCTTGGGAACACGCGCAGTGGCCCCCTACGGGGTGTCTCTCAAGAGCACTGCGCGCTGCGAGCTGCGGTACCCAGCAGCGCGGTGTCTGTGCCG
M R P L F L E L L G N H A Q C P Y G V L L K T H C P L R A A V T P A A G V C A R

GGAGAAGCCCGAGGCTCTGTGGCGGCCCGGAGGAGGAGACAGACCCCGCTGCGCTGTGTGACGTGCTCCGCGAGCAGCAGCGCCCTGGCAGGTGTACGGCTTGTGTGGCGCGCTG
E K P Q G S V A P E E E D T D P R L V Q L L R Q H S S P W Q V Y G F V R A C

CCTGCGCGCGCTGGTCCCCAGGCGCTTGGGGCTTCAGGCAACAAGAGCGCGCTTCTCAGGAACAAGAGTTCATCTCCCTGGGAAGCATGCCAAGCTCTCGCTCAGGAGCT
L R R L V P P G L W G S R H N E R R F L R N T K K F I S L G K H A K L S L Q E L

GACGTGGAAGATGAGCGTGGGAGTGGCTTGGCTGCGCAGGAGCCAGGGGTGGCTGTGTTCGCGCGCAGAGCACCGTCTGCGTGAGGAGATCTGGCCAAGTTCCTGCACTGGCT
T W K M S V R D C A W L R R S P G V G C V P A A E H R L R E E I L A K F L H W L

GATGAGTGTGTACGCTGTGAGCTGCTCAGGTCTTCTTTATGTACCGGAGACCACTTCAAAAGAACAGGCTCTTTTCTACCGGAAGAGTGTCTGGAGCAAGTTCAAAGCATTGG
M S V Y V V E L L R S P F Y T E T T T P Q K N R L F F Y R K S V W S K A L F S V L N Y E

AATCAGACGCACTTGAAGAGGTGACGTGCGGAGCTGTGGAAGCAGAGGTGAGGAGCATCGGGAAGCAGGCCCGCCCTGTGACGTCCAGACTTCCGCTTCAATCCCAAGCCTGA
I R Q H L K R V Q L R E L S E A E V R Q H R E A R P A L L T S R L R F I P K P D

CGGGCTGCGCGGATGTGAACATGGACTACGTGCTGGGAGCCAGAACGTTCCCGAGAGAAAGAGGGCCGAGCGTCTCACCTCGAGGGTGAAGGCACTGTTTACGCGTCTCAACTACGA
G L R P I V N M D Y V V G A R T P R R E K R A E R L T S R V K A L F S V L N Y E

GCGGGCGCGCGCCCGGCTCTGTGGGCGCTCTGTGTGGGCTGGACGATATCCACAGGGCTGGCGCACCTTCTGTGCTGCTGTGGGGCCAGGACCCCGCGCTGAGCTGTACTT
R A R R P G L L G A S V L G L D D I H R A W R T F V L R V R A Q D P P P E L Y F

TGTCAAG
V K

GACAGGCTCAGGAGGTATCCCGCAGCATCATCAAAACCCAGAACAGTACTGCGTGGCTGGTATGCCGTGGTCA
D R L T E V I A S I I K P Q N T Y C V R R Y A V V Q

GAAGCGCGCCCATGGGACGTCGCGAAGGCTTCAAGAGCCACGTTCTACCTTGACAGACCTCCAGCGGTACATGCGACAGTTCGTGGCTCACCTGCGAGGAGACCGCCGCTGAGGGA
K A A H G H V R K A F K S H V S T L T D L Q P Y M R Q P V A H L Q E T S P L R D

TGCGCTGTGTCAGGACAGCTCTCCCTGAATGAGGCGAGTGGCTCTTCGACGCTTCTCTACGCTTCTATGTGCCACCAAGCGGCTGCGCATCAGGGGCAAGTCTACGTCAGTG
A V V I E Q S S S L N E A S S G L F D V F L R P M C H H A V R I R G K S Y V Q C

CCAGGGGATCCCGAGGGCTCCATCTCTCCACGCTGCTGTGAGCGCTGTGACGGGACATGGAGAACAGCTGTTTGGGGGATTCGGGGGACGGGCTGCTCTCGCTTGGTGA
Q G I P Q G S I L S T L L C S L C Y G D M E N K L F A G I R R D G L L L R L V D

TGATTTCTGTGTGTGACACTCACCTCACCCAGCGAAACCTTCTCAGGACCTGGTCCGAGGTGTCCCTGAGTATGGCTGCGTGGTGAACCTGCGGAAGACAGTGGTGAACCTCCC
D F L L V T P H L T H A K T F L R T L V R G V P E Y G C V V N L R K T V V N F P

TGTAGAAGACGAGGCCCTGGGTGGCAGGCTTTTGTTCAGATCGCGGCCACGGCTTATCCCTGGTGGCGGCTGCTGCTGATACCCGACCTGGAGGTGAGAGCGACTACTCCAG
V E D E A L G G T A F V Q M P A H G L F P W C G L L L D T R T L E V Q S D Y S R

GTGAGCGCACCTGGCGGAAGTGGAGCTGTGCCCGCTGGGGCAGGTGCTGCTGCGAGGCGGTGCTGCCACCTCTGCTTCCGTGTGGGGCAGGCGACTGCCAATCCCAAGGGTCAGA
*

TGCCACAGGGTGGCCCTCGTCCCATCTGGGGCTGAGCACAAATGCATCTTCTGTGGAGTGAAGGTGCTCACAACGGGAGCAGTTTCTGTGCTATTTGGTAA...

FIG. 11J



N-terminal domain truncated telomerase (ver. 2)

ATGCCGCGCGCTCCCGCTGCCGAGCGGTGGCTCCCTGCTGCGCAGCCACTACCGCGAGGTGCTGCGCTGGCCACGTTCTGTG
M P R A P R C R A V R S L L R S H Y R E V L P L A T F V
CGGCGCTGGGGCCCCAGGGCTGGCGCTGTGTCAGCGCGGGGACCGGGCGGCTTTCCGCGCGCTGGTGGCCAGTGCCTGGTGTGCTGCGCTGGGACGCGACGGCGCGCCCCCGCGCG
R R L G P Q G W R L V Q R G D P A A F R A L V A Q C L V C V P W D A R P P P A A
GGCCTCCCCGGGGTCCGGCTCCGGCTGGGGTTGAGGGCGCGCGGGGGAACAGCGACATGCCGAGAGCAGCGCAGGCGACTCAGGGCGCTTCCCCCGCAGGTG
G L P G V G V R L G L R A A G G N Q R H A E S S A G D S G R P P R R
A S P G S A S G W G * G R P G G T S D M R R A A Q A T Q G A S P A G
P P R G R R P A G V E G G R G E P A T C G E Q R R R R L R A L P P Q V
CCCCCTCTCCCGCAGGTGTCTGCTGAAGGAGCTGGTGGCCGAGTGTGTCAGAGGCTGTGCGAGCGCGCGCGAAGACGTGCTGGCCTTCCGGCTTCCGCGCTGTGGACGGGGCGCG
P S F R Q V S C L K E L V A R V L Q R L C E R G A K N V L A F G F A L L D G A R
CGGGGCCCCCGAGGCTTACCACCGAGCTGCGCAGCTACCTGCCAACACGGTGACCGACGCACTGCGGGGAGCGGGGCGTGGGGGCTGCTGCTGCGCGCGCTGGGCGACGAGCT
G G P P E A F T T S V R S Y L P N T V T D A L R G S G A W G L L L R R V G D D V
GCTGGTTACCTGCTGCGCAGCTGCGCGCTCTTTGTGCTGGTGGCTCCAGCTGCGCTACAGGTGTGCGGGCGCGCGCTGTACAGCTGCGCGCTGCGACTCAGCGCGCGCGCGCGCG
L V H L L A R C A L F V L V A P S C A Y Q V C G P P L Y Q L G A A T Q A R P P P
ACACGCTAGTGGACCCGAGGCGTCTGGATGCGAACGGGCGTGAACCATAGCGTACGGAGGCGGGGTCCCTCCGCGCTGCGAGCGCGGGGTGCGAGGAGCGGGGGCGAGTGC
H A S G P R R R L G C E R A W N H S V R E A G V P L G L P A P G A R R R G G S A
CAGCGGAAGTCTGCGGTGCCCAAGAGGCGCGAGGCGTGGCGCTGCCCTGAGCGGAGCGGACCGCGTGGGCGAGGCTCTGGGCGCACCGCGGCGAGCGGTGACCGAGTGA
S R S L P L P K R P R R G A A P E P E R T P V G Q G S W A H P G R T R G P S D R
TGGTTCTGTGGTGTGCTGCTGCCAGACCGCGGAAGACCACTCTTTGAGGGTGGCTCTCTGCGACGCGCACTCCACCCATCCGTTGGGCGCGCAGCACCGCGGGCGCGCG
G F C V V S P A R P A E E A T S L E G A L S G T R H S H P S V G R Q H H A G P P
ATCCACATCGCGGCCACCGCTCCCTGGGACACGCTTGTCCCCCGGTGTACGCGGAGACCAAGCACTTCCTCTACTCTCAGGCGACAAGGAGCAGCTGCGGGCTCTCTCTACTCAG
S T S R P P R P W D T P C P P V Y A E T K H F L Y S S G D K E Q L R P S F L L S
CTCTCTGAGGCCAGCCTGACTGGCGCTCGGAGGCTCGTGAGACCATCTTTCTGGGTTCCAGGCGCTGGATGCCAGGACTCCCGCGAGGTGCCCCGCTGCCCCAGCGCTACTGGCA
S L R P S L T G A R R L V E T I F L G S R P W M P G T P R R L P R L P Q R Y W Q
AATGCGGCGCTGTTTCTGGAGCTGCTTGGGAACACGCGCAGTGCCTTACGGGTGCTCTCAAGACGCACTGCGCGCTGCGAGCTGCGGTACCCAGCAGCGCGTGTCTGTGCGCG
M R P L F L E L L G N H A Q C P Y G V L L K T H C P L R A A V T P A A G V C A R
GGAGAAGCCCGAGGCTCTGTGGCGGCCCCGAGGAGGAGACACAGACCCCGTCCGCTGGTGCAGCTGCTCCGCGACACAGCAGCCCTGGCAGGTGTACGGCTTCTGTGCGCGCTG
E K P Q G S V A A P E E E D T D P R R L V Q L L R Q H S S P W Q V Y G F V R A C
CCTGCGCGCGCTGGTGGCCCCAGGCTCTGGGGTCCAGGCACAACGAACGCGCTTCTCAGGAACACCAAGAGTTCATCTCCCTGGGGAAGCATGCCAAGCTCTCGTGCAGGAGCT
L R R L V P P G L W G S R H N E R R F L R N T K K F I S L G K H A K L S L Q E L
GACGTGGAAGATGAGCGTGGGGACTGCGCTTGGCTGCGCAGGAGCCAGGGTGGCTGTGTTCCGGCGCGCAGAGCACCGTCTGCGTGAGGAGATCTGGGCCAAGTTCCTGCACTGGCT
T W K M S V R D C A W L R R S P G V G C V P A A E H R L R E E I L A K F L H W L
GATGAGTGTGACGTGCTGAGCTGCTCAGGTCTTTCTTTATGTACGGAGACACGTTTCAAAAGAACAGGCTCTTTTCTACCGGAAGAGTGTCTGGAGCAAGTTCAAAGCAATTGG
M S V Y V V E L L R S F F Y V T E T T F Q K N R L F F Y R K S V W S K L Q S I G
AAT--NNN--GACAGTCACAGGGGGTTGACCGCGGACTGGGCGTCCCGAGGTTGACTATAGGACAGGTGTCCAGGTGCCCTGCAAGTAGAGGGCTCTCAGAGCGCTGTGGCTG
CATGGGTGGACGTGGCCCCGGGCATGGCCTTCTGCGTGTGCTGCCGTGGGTGCCCTGAGCCCTCACTGAGTGGTGGGGCTTGTGGCTTCCCGTGAGCTTCCCCCTAGTCTGTGTCTG
GCTGAGCAAGCCTCTGAGGGGCTCTCTATTG.

FIG. 11L



Truncated protein 1 (ver. 2)

ATGCCGCGCGCTCCCGCTGCCGAGCCGTGGCTCCCTGCTGCGCAGCCACTACCGCGAGGTGCTGCCGCTGGCCACGTTCTGTG
M P R A P R C R A V R S L L R S H Y R E V L P L A T F V
CGGCGCTGGGGCCCCAGGGCTGGCGGCTGTGCAAGCGCGGACCGCGCGCTTTCCGCGCGCTGGTGGCCAGTGCCTGGTGTGCGTGCCTGGGACGACGGCGCGCCCCCGCGCG
R R L G P Q G W R L V Q R G D P A A F R A L V A Q C L V C V P W D A R P P P A A
GGCCTCCCGGGTCCGCGTCCGCTGGGGTTGAGGGCGCGCGGGGGAACAGCGACATGCGGAGAGCAGCGCAGGCGACTCAGGGCGCTTCCCCCGCAGGTG
G L P G V G V R L G L R A A G G N Q R H A E S S A G D S G R F P R R
A S P G S A S G W G * G R P G G T S D M R R A A Q A T Q G A S P A G
P P R G R R P A G V E G R G E P A T C G E Q R R R L R A L P P Q V
CCCCCTCTCCGCGAGGTGCTGCTGCTGAAGGAGCTGGTGGCCGAGTGTGTCAGAGGCTGTGCGAGCGCGCGCGAAGAACTGCTGGCCTTCCGCTTCCGCGTGTGACGGGCGCG
P S F R Q V S C L K E L V A R V L Q R L C E R G A K N V L A F G F A L L D G A R
CGGGGCCCCCGAGGCTTCCACACGAGCTGCGCAGCTACCTGCCAACACGCTGACCGACGCACTGCGGGGAGCGGGCGTGGGGCTGCTGCTGCGCGCGTGGGCGACGAGCT
G G P P E A F T T S V R S Y L P N T V T D A L R G S G A W G L L L R R V G D D V
LCTGGTTCACCTGCTGCGCAGCTGCGCGCTCTTTGTGCTGGTGGCTCCAGCTGCGCTACCAAGTGTGCGGCGCGCGCTGTACAGCTGCGCGCTGCGCACTCAGGCGCGCGCCCCCGC
L V H L L A R C A L F V L V A P S C A Y Q V C G P P L Y Q L G A A T Q A R P P P
ACACGCTAGTGGACCCGAGGCGTCTGGGATGCGAACGGGCGTGGAACTAGCGTACGGGAGCGCGGGTCCCTTGGGCTGCCAGCCCCGGGTGCGAGGAGCGCGGGGCGAGTGC
H A S G P R R R L G C E R A W N H S V R E A G V P L G L P A P G A R R R G G S A
CAGCGAAGTCTGCGCTTCCCAAGAGCGCGAGCGCTGCGCTGCCCTGAGCGGAGCGGACCGCGTGGGCGAGGGTCTGGGCGCACCGGGGCGAGCGGTGGACCGAGTGACCG
S R S L P L P K R P R R G A A P E P E R T P V G Q G S W A H P G R T R L R P S F L L S
TGGTTCTCTGTGTGTGCTACCTGCCAGACCGCGCGAAGAGCCACTCTTTGGAGGGTGGCTCTCTGCGACGCGCCACTCCCACTCCCTGGGCGCGCAGCACCGCGGGCCCCC
G F C V V S P A R P A E E A T S L E G A L S G T R H S H P S V G R Q H H A G P P
ATCCACATGCGCGCCACCGCTCCCTGGGACACGCTTGTCCCCCGGTGTACCGGAGACCAAGCACTTCTCTACTCTCAGGCGACAAGGAGCAGCTGCGGCGCTCTCTCTACTCAG
S T S R P P R P W D T P C P P V Y A E T K H F L Y S S G D K E Q L R P S F L L S
CTCTCTGAGGCCAGCCTGACTGCGCTCGAGGCTCGTGGAGACCATCTTTCTGGGTTCAGGCGCTGGATGCCAGGACTCCCCGAGGTTGCCCCGCTGCCCGAGCGCTACTGGCA
S L R P S L T G A R R L V E T I F L G S R P W M P G T P R R L P R L P Q R Y W Q
AATGCGGCCCTGTTTCTGGAGTGTCTGGGAACACCGCGAGTGCCTACGGGGTGTCTCTCAAGACGCACTGCCCGCTGCGAGCTGCGGTACCCCCAGCAGCGGTGTCTGTCCCG
M R P L P L E L L G N H A Q C P Y G V L L K T H C P L R A A V T P A A G V C A R
GGAGAAGCCCGAGGCTGTGTGGCGGCCCGAGGAGGAGACACAGACCCCGTCCGCTGGTGCAGCTGTCCCGCAGCACAGCAGCCCTGGCAGGTGTACGGCTTCTGTGGGGCGCTG
E K P Q G S V A A P E E E D T D P R R L V Q L L R Q H S S P W Q V Y G F V R A C
CCTGCGCGGCTGGTGCCTCCAGGCTCTGGGGCTCCAGGCACAAAGAAAGCGCGCTTCTCAGGAAACCAAGAGTTCTCTCCCTGGGGAAGCATGGCAAGCTCTCGCTGCAGGAGCT
L R R L V P P G L W G S R H N E R R F L R N T K K F I S L G K H A K L S L Q E L
GACGTGGAAGATGAGCGTGGGAGTGTGCTGGCTGCGCAGGAGCCAGGGGTGGCTGTGTTCGGGCGCAGAGCACCGTCTGCGTGAGGAGATCTGGCCCAAGTCTCTGCACTGGCT
T W K M S V R D C A W L R R S P G V G C V P A A E H R L R E E I L A K F L H W L
GATGAGTGTGTACGTCTGAGCTGTCTAGGCTCTTTCTTTATGTACGGAGACCAAGTTTCAAAGAACAGGCTCTTTTCTACCGGAAGAGTGTCTGGAGCAAGTGTCAAAGCATTGG
M S V Y V V E L L R S F F Y V T E T T F Q K N R L P F Y R K S V W S K L Q S I G
AATCAGACAGCACTTGAAGAGGTGAGCTGCGGGAGCTGTGGAAGCAGAGGTGAGGAGCATCGGGAAGCCAGGCCCGCTGTGAGCTGAGCTGAGCTCCGCTTCATCCCAAGCGCTGA
I R Q H L K R V Q L R E L S E A E V R Q H R E A R P A L L T S R L R F I P K P D
GTGGCTGTGCTTTGGTTTAACTTCTTTTAAACAGAA
V A V L W F T F L F N Q K
CGGGCTGCGCGGATGTGAACATGGACTACGTGCTGGGAGCCAGAACGTTCCGAGAGAAAAGGGCGGAGCGTCTCACCTCGAGGGTGAAGGCACTGTTTCAGCGTGTCAACTACGA
G L R P I V N M D Y V V G A R T P R R E K R P S V S F R G *

FIG. 11M



Truncated protein 3 (ver. 2)

ATGCCGCGCGCTCCCGCTGCCGAGCGGTGCGCTCCCTGCTGCGCAGCCACTACCGCGAGGTGCTGCGCTGCGCCAGTTGCTG
M P R A P R C R A V R S L L R S H Y R E V L P L A T F V
CGGCGCTGGGGCCCCAGGGCTGGCGGTGGTGCAGCGCGGGGACCGGGCGGCTTTCGCGCGCTGGTGGCCAGTGCTGGTGGCTGGGACGACGGCGCGCCCCCGCGCG
R R L G P Q G W R L V Q R G D P A A P R A L V A Q C L V C V P W D A R P P P A A
GGCCTCCCGGGGTGCGCTCCCGCTGGGGTTGAGGGCGCGCGGGGGAACAGCGACATCGCGAGAGCAGCGCAGGCGACTCAGGGCGCTTCCCCCGCAGGTG
G L P G V G V R L G L R A A G G N Q R H A E S S A G D S G R F P R R
A S P G S A S G W G * G R P G G T S D M R R A A Q A T Q G A S P A G
P P R G R R P A G V E G G R G E P A T C G E Q R R R L R A L P P Q V
CCCTCTCCCGCAGGTGCTGCTGCTGAAGAGCTGGTGGCGCGAGTGTGCTGAGAGGCTGTGCGAGCGCGCGCGAAGAACTGCTGGCCTTCGCGCTTCGCGCTGCTGGACGGGGCGCG
P S F R Q V S C L K E L V A R V L Q R L C E R G A K N V L A F G F A L L D G A R
CGGGGGCCCCCGCAGGCTTCAACACAGCGTGCAGCTACCTGCCCAACAGGTGACCGAGCACTGCGGGGAGCGGGGCTGGGGCTGCTGCTGCGCGCGTGGGGCAGCAGCT
G G P P E A F T T S V R S Y L P N T V T D A L R G S G A W G L L L R R V G D D V
GCTGTTCACTGCTGCGCAGCTGCGCGCTCTTTGTGCTGGTGGCTCCAGCTGCGCTTCAAGGTGTGCGGGCGCGCTGTACAGCTGCGCGCTGCGCACTCAGGCGCGCGCCCCCGC
L V H L L A R C A L F V L V A P S C A Y Q V C G P P L Y Q L G A A T Q A R P P
ACAGCTAGTGGACCCGAGGCGCTGGGATGCGAAGCGGCTGGAACCATAGCGTACGGGAGCGGGGCTCCCTGGGCTGCGAGCGCGCGGGGCTGGGGGAGCGGGGCGAGTGC
H A S G P R R L G C E R A W N H S V R E A G V P L G L P A P G A R R R G G S A
CAGCGGAAGTCTGCGCTGCCAAGAGGCGCAGGCGTGGCTGCCCTGAGCGGAGCGGACGCCGCTGGGCGAGGGTCTGGGCGCAACCGGGCAGGACGCGTGGACGAGTACCG
S R S L P L P K R P R R G A A P E P E R T P V G Q G S W A H P G R T R G P S D R
TGGTTCTGTGTGTGCTGCTGCGCAGACCCCGCGAAGAACCCACTCTTTGGAGGTGCGCTCTCTGCGCAGCGCCACTCCACCCATCCGTTGGGCGCGCAGCAGCAGCGGGCCCCCG
G P C V V S P A R P A E A T S L E G A L S G T R H S H P S V G R H A G P P
ATCCACATCGCGGCGCAGCGCTCCCTGGGACACGCTTCCCCCGGTGTACGCGAGACCAAGCACTTCTCTACTCTCAGGCGACAGGAGCAGCTGCGGGCTCTCTCTACTCAG
S T S R P P R P W D T P C P P V Y A E T K H F L Y S S G D K E Q L R P S F L L S
CTCTCTGAGCGCCAGCTGCTGCGCGCTGGGAGCTGCTGGAGACCATCTTTCTGGTTTCAGGCGCTGGATGCGAGGACTCCCGCAGGTTCGCCCGCTGCGCCAGCGCTACTGGCA
S L R P S L T G A R R L V E T I F L G S R P W M P G T P R R L P R L P Q R Y W Q
AATGCGCGCTGTTCTGAGAGCTGCTGGGAACACGCGCAGTGCCTTACGCGGTGCTCTCAAGAGCACTGCGCGCTGCGAGCTGCGTCAACCGCAGCGCGGTGCTGCGCGG
M R P L F L E L L G N H A Q C P Y G V L L K T H C P L R A A V T P A A G V C A R
GGAGAAGCCCGAGGCTCTGTGGCGCGCGCGAGGAGGAGACAGACCCCGTCCGCTGGTGCAGCTGCTCGCGCAGCAGCAGCGCTGCGAGGTGTACGGCTGCTGCGCGCGCTG
E K P Q G S V A A P E E E D T D P R R L V Q L L R Q H S S P W Q V Y G F V R A C
CCTGCGCGCGCTGTTGCCCGCAGGCTTGGGGCTCCAGGCAACAAGAACCGCGCTTCTCAGGAACACAAAGATTCTCTCCCTGGGGAAGCATGCGAAGCTCTCGCTGCGAGGCT
L R R L V L W G S R H N E R R F L R N T K K F I S L G K H A S V W S K L Q E C L
GACGTGGAAGATGAGCGTCCGGGACTGCGCTTGGCTGCGCAGGAGCCAGGGGTGGCTGTGTTCCGCGCGCAGAGCACCGTCTGCGTGGAGAGTCTGCGCAAGTTCTGCTGCTGCGT
T W K M S V R D C A W L R R S P G V G C V P A A E H R L R E E I L A K F L H W L
GATGAGTGTGATGCTGAGCTGCTCAGGTCTTCTTTATGTACCGGACAGCAGTGTCAAAAGAACAGGCTCTTTTCTACCGGAAGAGTGTCTGGAGCAAGTTGCAAGCATTTGG
M S V Y F V T G E T T F Q K N R L F F Y R K S V W S K L Q S I G
AATCAGACAGCACTTGAAGAGGTGCGAGCTGCGGAGCTGTGGAAGCAGAGGTGAGGAGCATCGGGAAGCCAGGCGCGCTGCTGAGCTGCGACTCCGCTTCTATCCCAAGCTGA
I R Q H L K R V Q L R E L S E A E V R Q H R E A R P A L L T S R L R F I P K P D
CGGGTGGCGCGCTTGTGAACATGGAATACGCTGCGGAGCCAGAACGTTCCGAGAGAAAGAGGCGGAGCGTCTCACTCGAGGGTGAAGGCACTGTTACGCGTGTCAACTACGA
G L R P I V N M D Y V V G A R T F R R E K R A E R L T S R V K A L P S V L N Y E
GCGGGCGCGCGCGCGCTCTGCGCGCTGCGTGGGCTGAGCATACACAGGCGCTGCGCGACCTTCTGCTGCGTGTGCGGGCGCAGGACCGCGCGCTGAGCTGTACTT
R A R R P G L L G A S V L G L D D I H R A W R T F V L R V R A Q D P P P E L Y F
TGTCAAGTGGATGTGACGGGCGGTACGACACCATCCCCAGGACAGGCTACGAGGTCATCGCAGCATCATCAAAACCCAGAACAGTACTGCGTGGCTGCGTATGCGGTGGTCCA
V K V D V T G A Y D T I P Q D R L T E V I A S I I K P Q N T Y C V R R Y A V V Q
GAAGCGCGCCATGGGACGTCGCAAGGCTTCAAGAGCCAGCTCTCTACTTGAAGACCTCCAGCGGTACATGCGAGTTCGTTGGCTCACTGCGAGGAGACCGCGCTGAGGGA
K A A H G H V R K A P K S H V S T L T D L Q P Y M R Q P V A H L Q E T S P L R D
TGCGCTGCTATCGAGCAGAGCTCTCTGATGAGGCGCAGCAGTGGCTCTTCGAGCTCTCTCACTGCTGCGCAGCAGCGCGTGGCATCAGGGGCAAGTCTACGTCCAGTG
A V V I E Q S S S L N E A S S G L P D V P L R F M C H H A V R I R G K S Y V Q C
CCAGGGGATCCCGCAGGCTCCATCTCTCAAGCTGCTGCGAGCTGCTACGCGGACATGGAAGAACAGTGTGTTGGGGGATTGCGGGGAGCGGCTGCTCTGCTGTTGGTGA
Q G I P Q G S I L S T L L C S L C Y G D M E N K L F A G I R R D G L L L R L V D
TGATTCTTGTGTGACACCTCACTCAACCGCGAAACCTTCTCAGGACCTTGTGCGAGGTGCTCCGAGTGTGCTGAGTATGGCTGCGTGGTGAACCTGCGGAAGACAGTGGTGAACCTTCC
D F L L V T P H L T H A K T F L R V G V P E Y G C V V N L R K T V V N P P
TGTAGAAGACGAGGCGCTGGGTGGCAGGCTTTGTTCAGATGCGGCGCCAGCGCTATTCCCTGGTGGCGCTGCTGCTGGATACCGGACCTGAGGTGCGAGCGACTACTCCAG
V E D E A L G G T A F V Q M P A H G L F P W C G L L L D T R T L E V Q S D Y S R
GTGAGCGCACTGCGCGAAGTGGAGCTGTGCCGCTGGGGCAGGTGCTGCTGAGGCGCTGCTGCCACCTTCTGCTTCCGTGTTGGGGCAGGCGACTGCCAATCCCAAGGGTCAGA
TGCCACAGGCTGCCCTGCTCCATCTGGGGCTGAGCACAAATGCATCTTTCTGTTGGAGTGGGGTGCCTCACAACGGGAGCAGTTTCTGTGCTATTTTGGTAA

FIG. 11R

Protein that lacks motif A (ver. 2)



GGACCCTGGGAGCTCTGGGAATTTGGAGTGACCAAGGTGTGCCCTGTACACAGGCGAGGACCCTGCACCTGGATGGGGTCCCTGTGGGTCAAATTGGGGGGAGGTGCTGTGGGAGTAA
AATACTGAATATATGAGTTTTTCAGTTTTGA

FIG. 11U

FIG. 11V



Lacks motif A and altered C-terminus (ver. 2)

ATGCCGCGCGCTCCCGCTGCGGAGCGTGCCTCCCTGCTGCGCAGCCACTACCGCAGGCTGCTCCGCTGGCCAGCTTCGTG
M P R A P R C R A V R S L L R S H Y R E V L L P L A T F V

CGGCGCTGGGGCCCCAGGGCTGGCGCTGGTGCAGCGCGGGACCGGGCGGCTTTCGCGCGCTGGGCCAGTGCTGGTGTGGTGGCTGGGACGACCGGCGCGCGCGCGCG
R R L G P Q G W R L V Q R G D P A A F R A L V A Q C L V C V P W D A R P P P A A

GGCCTCCCGGGTTCGGCTCCGGCTGGGGTGGAGGGCGGGGGGGAACAGCGACATGCGGAGAGCAGCGCAGGCGACTCAGGGCGCTTCCCGCAGGCTG
G L P G V G V R L G L R A A G G N Q R H A E S S A G D S G R F P R R
A S P G S A S G W G * G R P G G T S D M R R A A Q A T Q G A S P A G
P P R G R R P A G V E G R G E P A T C G E Q R R R L R A L P P Q V

CCCTCCTTCGCGCAGGTGTCTGCTGAAGGAGCTGTGGCCGAGTGTGTCAGAGGCTGTGCGAGCGCGCGCGAAGAACTGCTGGCTTCGCGCTGCTGGACGGGGCCCG
P S F R Q V S C L K E L V A R V L Q R L C E R G A K N V L A F G F A L L D G A R

CGGGGGCCCCCGAGGCTTCACCAACAGCGTGCAGCTACCTGCCAACACGGTGACGACGCACTGCGGGGAGCGGGCGCTGGGGCTGCTGCTGCGCGCGTGGCGACGAGCT
G G P P E A F T T S V R S Y L P N T V T D A L R G S G A W G L L L R R V G D D V

GCTGGTTCACCTGCTGGCAGCTGCGCGCTCTTTGTGCTGGTGGCTCCAGCTCGCGCTACCGAGTGTGCGGGCGCGCTGTACAGCTCGCGCTGCGACTCAGGCGCGCGCGCGCG
L V H L L A L F V L A F S C A Y Q V C G P P L Y Q L G A A T Q A R P P P

ACACGCTAGTGAGCCCGAAGGCTGTGGATGCGAAGCGGCTGGAAACATAGCGTACGAGGAGCGCGGGTCCCTTGGGCTGCGAGCCCGGGTGGAGGAGCGCGGGGCGAGTGC
H A S G P R R R L G C E R A W N H S V R E A G V P L G L P A P G A R R R G G S A

CAGCGGAAGTCTGCGCTTCCCAAGAGCGCGAGCGTGTGCGCTGCGCGTGCAGCGGAGCGCGCGCTTGGGCGAGGGTCTGGGCGCACCGCGGCGAGCGCGGAGTGCAGCT
S R S L P L P K R P R R G A A P E P E R T P V G Q G S W A H P G R T R G P S D R

TGGTTCCTGTGGTGTGCTGCTGCGAGACCGCGAAGAGCCACTCTTTGGAGGGTGGCTCTTGGCAGCGCGCACTCCACCCATCCGCTGGGCGCGCAGCACCGCGGGCGCGCG
G P C V V S P A R P A E E A T S L E G A L S G T R H S H P S V G R Q H H A G P P

ATCCACATGCGCGCACCGCTGCTGGGACACGCTTGTCCCGCGTGTACGCGGAGACCAAGCACTTCTCTACTCTCAGGCGACAGGAGCAGCTGCGCGCGCTCTCTACTCTAG
S T S R P P R P W D T P C P P V Y A E T K H F L Y S S G D K E Q L R P L S

CTCTCTGAGCGCGAGCTGCTGCGCGCTGGAGGCTGTGTCGAGACCTCTTTCTGGGTTCCAGGCGCTGGATGCGAGGAGTCCCGCGAGGTTCGCGCGCTGCGCGCGCTACTGGCA
S L R P S L R T G A R R L V E T I F L G S R P W M P G T P R R L P R L P Q R Y W Q

AATGCGCGCGCTGTTCCTGAGAGTGTTCGGAACACCGCGAGTGCCTTACGGGGTGTCTCTCAAGAGCACTGCGCGCTGCGAGCTGCGGTACCCAGCAGCGGTGTCTGTGCGCG
M R P L P L E L L G N H A Q C P Y G V L L K T H C P L R A A V T P A A G V C A R

GGAGAAGCGCGCGCTGCTGCGCGCGCGCGAGGAGGAGACACAGACCGCGCTGCTGCTGCGAGTGTCTCCGCGACACAGCAGCGCGCTGGCAGGTGTACGGCTTGTGCGCGCGCTG
E K P Q G S V A A P E E E D T D P R R L V Q L L R Q H S S P W P A E H R L R E E I L A K F L H W L

CCTGCGCGCGCTGCTGCGCGCGCGCGCTTCCAGGCGACCAAGAGCGCGCTTCTCAGGAAACCAAGAGTTCTCTCCCTGGGGAAGCATGCGAAGCTCTGCTGCGAGGCT
L R R L V P P G L W G S R H N E R R F L R N T K K F I S L G K H A K L S L Q E L

GACGTGGAAGATGAGCGCTGCGGAGTGTGCTGCTGCGGAGCGCGCGGGTGTGCTGCTGCGCGCGCAGAGCAGCGCTGCTGCTGAGGAGATCTGGCGAAGTTCTGCTACTGGT
T W K M S L V R D C A W L R R S P G V G T V P A A E H R L R E E I L A K F L H W L

GATGAGTGTGACGTGCTGAGTGTCTTCTTTATGTACCGAGACCACTTCAAAGAGAGGCTCTTTTCTACCGAAGAGTGTCTGAGCAAGTTGCAAGCATTGG
M S V Y V V E L L R S F F Y V T E T T P Q K N R L P F Y R K S V W S K L Q S I G

AATCAGACGACTTGAAGAGGGTGCAGCTGCGGAGCTGTGCGAAGCAGAGGTGAGGAGCATCGGAGCCAGCGCGCGCTGCTGAGCTGAGACTCGGCTTCTATCCCAAGCGCTGA
I R Q H L K R V Q L R E L S E A E V R Q H R E A R P A L L T S R L R F I P K P D

CGGGCTGCGCGCGATGTGAACATGGAATACGCTGCTGGGAGCGAGACGTTCCGAGAGAAAGAGGGCGGAGCGTCTCACCTGAGGGTGAAGGCACTGTTTACGCGTCTCAACTACGA
Q G I P Q G S V I L S T L L C S L C Y G D M E N K L F A G I R R D G L L R L V D

GCGGGCGCGCGCGCGCGCTCTGCGCGCGCTGCTGCTGCGCGCTGAGATACCAAGGCGCTGCGCGCACTTCTGCTGCTGCTGCGGGCGCGAGGACCGCGCGCTGAGCTGTACTT
R A R R P G L L G A S V L G L D D I H R A W R T F V L R V R A Q D P P P E L Y F

TGTCAAG
V K GACAGGCTCAGGAGTATCGCCAGCATCATCAAAACCGAGAACGTAAGTGTGCGTGGTGTGCGGTGCTCA

D R L T E V I A S I I K P Q N T Y C V R R Y A V V Q

GAAGCGCGCCATGGGCACTGCGCAAGGCTTCAAGAGCCAGTCTCTACCTTACAGACCTCCAGCGGTACATGCGAGTTCGTGGCTCACGTCAGGAGACAGCGCGCTGAGGGA
K A A H G H V R K A F K S H V S T L T D L Q P Y M R Q F V A H L Q E T S P L R D

TGCGCTGCTATCGAGCAGAGCTCTCTCTGAATGAGGCGAGCAGTGGCTCTTCGAGCTTCTCTACGCTTCTATGTCACCAACCGCGTGCATCAGGGCAAGTCTACGTCAGTG
A V V I E Q S S S L N E A S S G L F D V F L R F M C H H A V R I R G K S Y V Q C

CCAGGGATCCCGCAGGGCTCCATCTCTCCACGCTGCTGCGAGCGTGTGCTACGGGACATGGGAAACAGCTGTTTGGGGGATTGCGGGGAGCGGGCTGCTCTGCTGTTGGTGA
Q G I P Q G S V I L S T L L C S L C Y G D M E N K L F A G I R R D G L L R L V D

TGATTCTTGTGTGAGCACTCACCTACCCACGCGAAACCTTCTCAGGACCTTGTGCGAGGTGTGCTGAGTATGCTGCGTGGTGAAGTTCGGAAGACAGTGTGAAGTTCCTC
D F L L V T P H L T H A K T F L R T L V R G V P E Y G C V V N L R K T V V N F P

TGTAGAAGAGGCGCTGGTGGCAGGCTTTTGTTCAGATGCGCGCGCAAGGCTTATCCCTGCTGCGCGCTGCTGCTGAGTACCGGAGCTGGAGGTGAGAGGCACTACTCCAG
V E D E A L G G T A F V Q M P A H G L F P W C G L L L D T R T L E V Q S D Y S S

CTATGCGCGAGCTCCATCAGAGCAGTCTCACTTCAACCGCGCTTCAAGGCTGGAGGAAACATGCTGCGAACTCTTGGGGTCTTGGCGCTGAAGTGTCAAGCTGTTTCTGGA
Y A R T S I R A S L T F N R G F K A G R N M R R K L F G V L R L K C H S L F L D

TTTGAGGTGAACAGCTTCCAGAGGTTGACCAACATCTCAAGATCTCTGCTGCGAGGCTTACAGGTTTACGCACTGTGCTGCGAGTCTCCATTTTATCAGCAAGTTTGAAGAA
L Q V N S L Q T V C T N I Y K I L L L Q A Y R F H A C V L Q L P F H Q Q V W K N

CCCCACATTTCTGCGCGTCTCTGACACGCGCTCTCTGCTACTCTCATCTGAAAGCAAGAACGCGAGGATGTGCTGGGGGCAAGGGCGCGCGCGCTCTGCGCTCCGA
P T P F L R V I S D T A S L C Y S I L K A K N A E

CCGAAGAAACATTTCTGCTGACTCTGCGGTGCTTGGGTC
E E N I L V V T P A V L G S

GGGACAGCCAGAGATGGAGCCACCGCGAGACCGTGGGTGGGAGCTTCCGGTGTCTCTGGGAGGGAGTGGGCTGGGCGCTGACTCTCTCAGCTCTGTTTCCCGCAG
G Q P E M E P P R R P S G V G S F P V S P G R G V G L G L *

FIG. 11W



domain
N-terminal truncated telomerase

ATGCCGCGCGCTCCCGCTGCCGAGCCGTCGCTCCCTGCTGCGCAGCCACTACCGCAGGTGCTGCCGCTGGCCACGTTCTGT
M P R A P R C R A V R S L L R S H A R E V L P L A T F V

CGGCGCTGGGGCCCCAGGGCTGGCGCTGGTGACGCGGGGACCCGGCGGCTTTCCGCGCTGTGGCCAGTGCTGGTGCTGCCCTGGGACGACGCGCGCCCCCGCGC
R R L G P Q G W R L V Q R G D P A A F R A L V A Q C L V C V P W D A R P P P A A

CCCTCTCTCCGCGAGGTGCTGCTGAAGGAGCTGGTGGCCGAGTGCTGAGAGGCTGTGCGAGCGCGCGGGAAGAACGCTGGGCTTCGGCTTCGCGCTGTGGACGGGGCCCC
P S F R Q V S C L K E L V A R V L Q R L C E R G A K N V L A F G F A L L D G A R

CGGGGCCCCCGAGGGCTTCACACAGCGTGCGCAGCTACCTGCCCAACACGGTGACCGACCTCGGGGGAGCGGGGCTGGGGGCTGTGCTGCGCGCTGGGCGACGAGCT
G G P P E A F T T S V R S Y L P N T V T D A L R G S G A W G L L L R R V G D D V

GCTGTTTCACTGCTGGCAGCTGCGCGCTTTTGTGCTGGTGGCTCCAGCTGCGGCTACAGGTGTGCGGCGCGCTGTACCAGCTCGGCGCTGCGCACTCAGGCCCGCGCCCCCGC
L V H L L A R C A L F V L V A P S C A Y Q V C G P P L Y Q L G A A T Q A R P P P

ACAGCTAGTGGACCCCGAGGGCTGGGATGCGAAGCGGCTGGAACATAGCGTCAGGAGCGCGGGTCCCCCTGGGCTGCCAGCCCCGGGTGCGAGGAGCGCGGGGCGAGTG
H A S G P R R R L G C E R A W N H S V R E A G V P L G L P A P G A R R R R G G S A

CAGCCGAAGTCTGCGTGGCCCAAGAGCGCGGCTGGCGCTGCCCTGAGCCGAGCGGACGCCCGTTGGGCGAGGGTCTGGGCCACCGGGGCGAGCGCGTGACCGAGTGACCG
S R S L P L P K R P R R G A A P E P E R T P V G Q G S W A H P G R T R G P S D R

TGGTTTCTGTGTGGTCACTGCTGAGACCGCGGGAAGCCACCTCTTTGGAGGGTGCGCTCTTGGCACGCGCACTCCACCCATCCGTGGGCGCGCAGCACACCGGGCCCCC
G F C V V S P A R P A E E A T S L E G A L S G T R H S H P S V G R Q H H A G P P

ATCCATCTCGCGCCACACGCTCCCTGGGACAGCTTTGCCCCGGTGACCGGAGACCAAGCACTTCTCTACTCTCAGGCGCAAGGAGCAGCTGCGGCCCTCTCTCTACTCAG
S T S R P P R P W D T P C P P V Y A E T K H F L Y S S G D K E Q L R P S F L L S

CTCTGAGGCCACGCTGACTGGCGCTCGGAGGCTCGTGAGACCATCTTTTGGGTTCCAGGCTGATGCCAGGACTCCCGCAGGTGTGCCCGCTGCGCCAGGCTACTGCA
S L R P S L T G A R R L V E T I F L G S R P W M P G T P R R L P R L P Q R Y W Q

AATCGGCCCCCTGTTTCTGGAGCTGCTTGGGAACACGCGAGTGCCCTACGGGGTCTCTCAAGACGCACTGCCCGCTGCGAGCTGCGGTACCCCCAGCAGCGGTGTCTGTGCCCG
M R P L P L E L L G N H A Q C P Y G V L L K T H C P L R A A V T P A A G V C A R

GGAGAAGCCCCAGGGCTCTGCGCGGCCCCGAGGAGGAGCACAGACCCCGCTGCGCTGGTGAGCTGCTCCCGCAGCACAGCAGCCCCGCGAGGTGTACGGCTTCGTGCGGGCTG
E K P Q G S V A A P E E E D T D P R R L V Q L L R Q H S S P W Q V Y G F V R A C

CCTGCGCGCTGGTCCCCCAGGCTCTGGGCTCCAGGCACAAAGCGCGCTTCTCAGGAACCAAGATTCTCTCCCTGGGGAAGCATGCCAAGCTCTCGTGCGAGGCT
L R R L V P P G L W G S R H N E R R F L R N T K K F I S L G K H A K L S L Q E L

GACGTGGAAGATGAGCGTGGGAGCTGCGCTGGCTGCGCAGGAGCCAGGGTGGCTGTGTTCCGCGCGCAGAGCACCGTCTGCGTGAGGAGATCTGGCCAAGTCTCTGCACTGGCT
T W K M S V R D C A W L R R S P G V G C V P A A E H R L R E E I L A K F L H W L

GATGAGTGTGTACGCTGCGAGCTGCTCAGGTCTTTCTTTATGTACGGAGACCGTTTCAAAAGAACAGGCTCTTTTCTACCGAAGAGTGTCTGGAGCAAGTTGCAAGCATTTGG
M S V Y V V E L L R S F F Y V T E T T F Q K N R L F P Y R K S V W S K L Q S I G

AAT - - NNN - - GACAGTACACAGGGGGTTGACCGCGGACTGGCGCTCCCGAGGTTGACTATAGGACAGGTGTCCAGGTGCCCTGCAAGTAGAGGGGCTCTCAGAGGCGCTGCGCTG
CATGGTGGAGCTGGCCCCGGCATGGCTTCTGCGTGTGCTGCCGTGGGTGCCCTGAGCCCTCACTGAGTGGTGGGGCTTGTGGCTTCCCGTGAGCTTCCCCCTAGTCTGTGTGCTG
GCTGAGCAAGCCTCTGAGGGGCTCTCTATTG...

FIG. 11A



Truncated protein 1

ATGCCGCGCGCTCCCGCTGCCGAGCCGTGCGCTCCCTGCTGCGCAGCCACTACCGGAGGTGCTGCCGCTGGCCACGTTCTGT
M P R A P R C R A V R S L L R S H R E V L P L A T F V

CGGCGCTGGGGCCCCAGGGCTGGCGGTGGTGACGCGGGGACCCGCGGCTTTCCGCGCGTGGTGGCCAGTGCTGGTGGCTGGCTGGGACGACGCGCGCCCCCGCGCG
R R L G P Q G W R L V Q R G D P A A F R A L V A Q C L V C V P W D A R P P P A A

CCCTCTCTTCCGCCAGGTGCTGCTGAAGGAGCTGGTGGCCGAGTGCTGACAGGCTGTGCGAGCGCGGCGGAAGAACGCTGCTGGCTTCGGCTTCGGCTGCTGGACGGGGCCCG
P S F R Q V S C L K E L V A R V L Q R L C E R G A K N V L A F G F A L L D G A R

CGGGGGCCCCCGAGGCGCTTACCACAGCGTGGCAGCTACCTGCCAACACAGGTGACCGCACTGCGGGGAGCGGGCGTGGGGCTGCTGCTGCGCGCGTGGGCGACGACGT
G G P P E A F T T S V R S Y L P N T V T D A L R G S G A W G L L L R R V G D D V

GCTGGTTACCTGCTGGCAGCTGCGCGCTCTTTGTGCTGGTCCAGCTGCGCTTACCAGGTGTGGGGCGCGCGTGTACCAGCTCGCGCTGCCACTCAGGCCCGCGCCCCCGCG
L V H L L A R C A L F V L V A P S C A Y Q V C G P P L Y Q L G A A T Q A R P P P

ACAGCTAGTGGACCCGAAGGCGCTGGGATGCGAAGCGGCTGGAACCATAGCGTCAGGAGCGCGGGTCCCTTGGGCTGCCAGCCCCGGGTGCGAGGAGCGCGGGGCGAGTGC
H A S G P R R R L G C E R A W N H S V R E A G V P L G L P A P G A R R R G G S A

CAGCCGAAGTCTGCGTGGCCAAAGAGCCAGGCGTGGCGCTGCCCTGAGCGGAGCGGACGCGCTTGGGAGGGGCTTGGGCCACCGGGCAGGACGCGTGGACCGAGTGACCG
S R S L P L P K R P R R G A A P E P E R T P V G Q G S W A H P G R T R G P S D R

TGGTTTCTGTGTGTGTGCTGCTGCGAGCCCGCGGAAGCCACCTCTTGGAGGGTGGCTCTCTGCGACGCGCCACTCCACCCATCGTGGGCGCGCAGCACCACCGGGCCCCCG
G F C V V S P A R P A E E A T S L E G A L S G T R H S H P S V G R Q H H A G P P

ATCCATCTGCGGCCACCGTCCCTGGGACAGCGCTTGTCCCCGGTGTACCGCGAGACCAAGCACTTCTCTACTCTCAGCGACAAAGAGCAGCTCGCGCTCTCTCTACTAG
S T S R P P R P W D T P C P P V Y A E T K H F L Y S S G D K E Q L R P S F L L S

CTCTCTGAGGCCAGCTGACTGGCGCTCGGAGGCTCGTGAGACCATCTTTCTGGGTTCCAGGCCCTGGATGCCAGGACTCCCGCAGGTTGCCCGCTGCCAGCGCTACTGGCA
S L R P S L T G A R R L V E T I F L G S R P W M P G T P R R L P R L P Q R Y W Q

AATCGGCCCCCTGTTCTGAGCTGCTTGGAAACACGCGCAGTGCCCTACCGGGTGTCTCTCAAGACGCACTGCCCGCTGCGAGCTGCGGTACCCACAGCAGCGGTGTCTGTGCCG
M R P L P L E L L G N H A Q C P Y G V L L K T H C P L R A A V T P A A G V C A R

GGAGAAGCCCCAGGGCTCTGTGGCGCCCCGAGGAGGAGGACACAGACCCCGTGGCTGGTGACGTGCTCCGCGAGCACAGCAGCCCTGGCAGGTGTACGGCTTCGTGGGGCTG
E K P Q G S V A A P E E E D T D P R R L V Q L L R Q H S S P W Q V Y G F V R A C

CCTGCGCGCTGGTGGCCCCAGGCTCTGGGGCTCCAGGCAACAGCAAGCGCTCTCTCAGGAACACCAAGAGTTCTCTCCCTGGGGAAGCATGCCAAGCTCTCGTGCAGGAGCT
L R R L V P P G L W G S R H N E R R P L R N T K K F I S L G K H A K L S L Q E L

GACGTGGAAGATGAGCTGCGGAGCTGCGCTTGGCTGCGCAGGAGCCAGGGGTGGCTGTGTCCGCGCGCAGAGCACCGTCTGCTGAGGAGATCTGGCCAAGTTCTGCTGACTGGCT
T W K M S V R D C A W L R R S P G V G C V P A A E H R L R E E I L A K F L H W L

GATGAGTGTACGTGCTGAGCTGCTCAGGTCTTTCTTTATGTACGAGAGCACGTTTCAAAAGAACAGGCTCTTTTCTACCGGAAGAGTGTCTGGAGCAAGTTGCAAGCATTGG
M S V Y V V E L L R S F F Y V T E T T F Q K N R L F F Y R K S V W S K L Q S I G

AATCAGACAGCACTTGAAGAGGGTGACGTGCGGAGCTGTGGAAGCAGAGGTGAGGCAGCATCGGAAGCCAGGCCCGCTGCTGACGTCCAGACTCCGCTTCATCCCAAGCCTGA
I R Q H L K R V Q L R E L S E A E V R Q H R E A R P A L L T S R L R F I P K P D

GTGGCTGTGCTTGGTTTAACTTCCTTTTAAACAGAA
V A V L W F T F L F N Q K

CGGGCTGCGCGGATTGTGAACATGGAATACGTGCTGGGAGCCAGAACGTTCCGAGAGAAAAGAGGCGGAGCGTCTACCTCGAGGGTGAAGGCACTGTTACGCTGCTCAACTACGA
G L R P I V N M D Y V V G A R T F R R E K R P S V S F R G *

FIG. 11B



Truncated protein 2

ATGCCGCGCGCTCCCGCTGCCGAGCCGTCGCTCCCTGCTGCGCAGCCACTACCGCGAGGTGCTGCCGCTGGCCACGTTGCTG
M P R A P R C R A V R S L L R S H R E V L P L A T F V

CGGCGCTGGGCCCCAGGGCTGGCGGCTGGTGACGCGGGGACCGCGGCTTTCCGCGCGCTGGTGCCCACTGGTGCTGGCCCTGGGACGCACGGCCGCCCCCGCCG
R R L G P Q G W R L V Q R G D P A A F R A L V A Q C L V C V P W D A R P P P A A

CCCTCTCTCCGCGAGGTGCTGCTGAAGGAGCTGGTGCCCGAGTGCTGACAGGCTGTGCGAGCGCGCGGCGAAGAACGCTGGCTTCGGCTTCGCGCTGCTGACGGGGCCG
P S F R Q V S C L K E L V A R V L Q R L C E R G A K N V L A F G F A L L D G A R

CGGGGGCCCCCGAGGCTTCACCAACAGCGTGCGCAGCTACCTGCCCAACACGGTGACCGACGCTGCGGGGAGCGGGGCTGGGGGCTGCTGCTGCGCGCTGGGCGACGAGCT
G G P P E A F T T S V R S Y L P N T V T D A L R G S G A W G L L L R R V G D D V

GCTGTTTCACTGCGCAGCTGCGCGCTTTTGTGCTGGTGCTCCAGCTGCGGCTACCAAGTGCTGGGGCGCGCTGTACCACTGCGCGCTGCGCACTAGGCGCGCGCCCCCGC
L V H L L A R C A L F V L A P S C A Y Q V C G P P L Y Q L G A A T Q A R P P P

ACACGCTAGTGAGCCCCGAAGCGCTGGGATGCGAAGCGGCTGGAACTAGCGTCAGGAGCGCGGGTCCCTGGGCTGCCAGCCCCGGGTGCGAGGAGCGCGGGGCGAGTGC
H A S G P R R R L G C E R A W N H S V R E A G V P L G L P A P G A R R R G G S A

CAGCGAAGTCTGCGCTGCGCAAGAGCGCGGCTGGCGCTGCCCTGAGCGGAGCGGAGCGCGTGGGCGAGGGTCTGGGCCACCGCGGAGGACGCGTGGAACGAGTGACCG
S R S L P L P K R P R R G A A P E P E R T P V G Q G S W A H P G R T R G P S L R

TGGTTTCTGTGGTGCTCACTGCGCAGACCGCGGAGGAGCCACTCTTGGAGGGTGCGCTCTCTGGCAGCGCCACTCCCACTCCGTTGGGCGCGCAGCACCAACCGGGCCCCC
G F C V V S P A R P A E E A T S L E G A L S G T R H S H P S V G R Q H H A G P P

ATCCACTCAGCGGACCACTGCTGGGACAGCGCTTGTCCCGGTGACGCGAGACCAAGCACTTCTCTACTCTCAGGCGCAAGGAGGAGCTGCGGCGCTCTCTACTCAG
S T S R P P R P W D T P C P P V Y A E T K F L Y S S G D K E Q L R P S F L L S

CTCTCTGAGCGCCAGCTGACTGGCGCTCGGAGGCTCTTGGGTTCCAGGCGCTGATGCCAGGACTCCCGCAGGTTGCCCGCTGCGCGCTGCGCGAGGCTACTGGCA
S L R P S L T G A R R L V E T I F L G S R P W M P G T P R R L P R L P Q R Y W Q

AATCGGCGCGCTGTTCTGAGGCTGCTTGGGAACACCGCGAGTGCCCTACCGGGTGCTCTCAAGACGCACTGCCGCTGCGAGCTGCGGTCACTCCAGCAGCGCGGTGCTGTGCGCG
M R P L F L E L L G N H A Q C P Y G V L L K T H C P L R A A V T P A A G V C A R

GGAGAAGCCCCAGGCTCTGTGCGGCCCCGAGGAGGAGACACAGACCGCGCTGCGCTGGTGAGCTGCTCCGCGAGCAGCAGCGCTGCGAGGTGACGCTTCTGCGGGCGT
E K P Q G S V A A P E E E D T D P R R L V Q L L R Q H S S P W Q V Y G R A C T

CCTGCGCGCTGGTCCCCAGGCTCTGGGCTCCAGGACAAAGCGCGCTTCTCAGGAACCAAGAGTTTCTCTCCGTTGGGAAGCATCCCAAGCTCTGCTGCGAGGCT
L R R L V P P G L W G S R H N E R R F L R N T K K F I S L G K H A K L S L Q E L

GACGTGGAAGATGAGCGTGGGAGTGGCTGGTGCGCAGGAGCCAGGGGTGGCTGTTCCGCGCAGAGCAGCTGCTGCTGAGGAGATCCTGGCAAGTTCTGCACTGGCT
T W K M S V R D C A W L R R S P G V G C V P A A E H R L R E E I L A K F L H W L

GATGAGTGTGTACGCTGCGAGCTGCTCAGGCTTTCTTTATGTACGAGAGCCAGTTTCAAAGAACAGGCTCTTTTCTACCGAAGAGTGTCTGAGCAAGTTGCAAGCATTTG
M S V Y V V E L L R S F P Y V T E T T F Q K N R L F P Y R K S V W S K L Q S I G

AATCAGACAGCACTTGAAGAGGTGCGAGTGGCGAGCTGTCGGAAGCAGAGTCCAGGACGATCGGGAAGCCAGGCGCGCTGCTGAGTCCAGACTCCGCTTCATCCCAAGCTGA
I R Q H L K R V Q L R E L S E A E V R Q H R E A R P A L L T S R L R F I P K P D

CGGGCTGCGGCGATTGTGAACATGACTACGTCGTGGGAGCCAGAACGTTCCGCGAGAGAAAGAGGCGGAGCGTCTACCTCGAGGGTGAAGGCACTGTTACGCGTGTCAACTACGA
G L R P I V N M D Y V V G A R T F R R E K R A E R L T S R V K A L F S V L N Y E

GCGGGCGCGCGCGCGCTCTGGGCGCTCTGCTGGGCTGGACGATATCCACAGGCGCTGGCGCACTTCTGCTGCTGCTGCGGGCCAGGACCGCGCGCTGAGCTGTACTT
R A R R P G L L G A S V L G L D D I H R A W R T F V L R V R A Q D P P P E L Y F

TGTCAAGGTGGATGTACGGGCGGTACGACCACTCCCGCAGGACAGGCTACCGAGGTATCGCCAGCATCATAAACCCAGAACAGTACTGCGTGGCTGGTATCCGCTGGTCCA
V K V D Y T G A Y D T I P Q D R L T E V I A S I I K P Q N T Y C V R R Y A V V Q

GAAGCGCGCATGGGACGTCGCAAGGCTTCAAGAGCCAC
K A A H G H V R K A F K S H

GTCCTACGTCCAGT
V L R P V

CCAGGGATCCCGCAGGCTCCATCTCTCCAGCTGCTGCGAGCTGTGCTACGGGACATGGAGAACAGCTGTTTGGGGGATTCCGGGGGACGGGCTGCTCTGCGTTTGGTGA
P G D P A G L H P L H A A L Q P V L R R H G E Q A V C G D S A G R A A P A P X G

TGATTCTTGTGGTGACACTCACCTCACCCACGCGAAACCTTCTCAGGACCTGGTCCGAGGTGCTCCCTGAGTATGGCTGCGTGGTGAACCTTGGCGAAGACAGTGGTGAACCTTCCC

FIG. 11C



Truncated protein 3

ATGCCGCGCGCTCCCGCTGCCGAGCCGTGCGCTCCCTGCTGCGCAGCCACTACCGGAGGTGCTGCCGCTGGCCAGTTCTGTG
M P R A P R C R A V R S L L R S H R E V L P L A T F V

CGGCGCTGGGGCCCCAGGGCTGGCGGCTGGTGACGCGGGGACCGGCGGCTTCCGCGCGCTGGTGGCCAGTGCTGGTGTGCTGGCCCTGGGACGACGCGCGCCCCCGCGCG
R R L G P Q G W R L V Q R G D P A A F R A L V A Q C L V C V P W D A R P P P A A

CCCCCTCTTGGCAGGTGCTGCTGCTGAAGGAGCTGGTGGCCGAGTGCTGACAGGCTGTGCGAGCGCGCGGAAGACGTGCTGGCTTCCGCTTCCGCTGCTGGACGGGGCCCC
P S F R Q V S C L K E L V A R V L Q R L C E R G A K N V L A F G F A L L D G A R

CGGGGGCCCCCGAGGCTTACCACAGCGTGCAGCTACCTGCCCAACACGCTGACGACGCTGCGGGGAGCGGGGCTGGGGGCTGCTGCTGCCGCGTGGCGACGACGT
G G P P E A F T T S V R S Y L P N T V T D A L R G S G A W G L L L R R V G D D V

GCTGGTTACCTGCTGGCAGCTGCGCGCTCTTTGTGCTGGTGGCTCCAGCTGCGGCTACAGGTGTGCGGGCGCGCTGTACCAGCTGCGGCTGCCACTCAGGCCCGCCCCCGC
L V H L L A R C A L F V L V A P S C A T V C G P P L Y Q L G A A T Q A R P P P

ACACGCTAGTGGACCCGAGGCTGGGATGCGAAGCGCTGGAACATAGCGTCAGGAGGCGGGGCTCCCTGGGCTGCCAGCCCCGGGTGGAGGAGCGCGGGGCGAGTGC
H A S G P R R R L G C E R A W N H S V R E A G V P L G L P A P G A R R R G G S A

CAGCGAAGTCTGCGTGGCCAGGAGCGCGGCTGGCGCTGCGGCTGAGCGGAGCGGCGCGGCTGGGCGAGGCTGCGGCCACCGGGCAGGACGCTGGACCGAGTGACCG
S R S L P L P K R P R R G A A P E P E R T P V G Q G S W A H P G R T R G P S D R

TGGTTTCTGTGGTGTGCTGCTGCGACGCGCGGAAGACCACTCTTTGGAGGTGCGCTCTCTGGCAGCGGCACTCCACCCATCCGTGGGCGCGCAGCACACGCGGGCCCCC
G F C V V S P A R P A E E A T S L E G A L S G T R H S H P S V G R Q H H A G P P

ATCCACATCGCGGACACAGTCCCTGGGACAGCTTGTCCCCGCTGTAGCGGAGACCAAGCACTTCTTACTCTCAGGCGAAGAGGAGCTGCGGCGCTCTCTACTCAG
S T S R P P R P W D T P C P P V Y A E T K H F L Y S S G D K E Q L R P S F L L S

CTCTCTGAGGCCAGCTGCTGCGGCTGCGAGGCTCGTGAGGACCATCTTTCTGGGTTCAGGCGCTGGATGCCAGGACTCCCGCAGGTGCGCGGCTGCGCCAGGCTACTGCA
S L R P L P L R T I F L G A R L V E T I F L G S R V M P G T P R R L P R L P Q R Y W Q

AATGCGGCGCTGTTCTGAGCTGCTTGGGAACACGCGAGTGCCTTACGGGTGCTCTCAAGACGACTGCCCGCTGCGAGCTGCGGTACCCAGCAGCGCGTGTCTGTGCCCG
M R P L P L F L E L L G N H A Q C P Y G V L L K T H C P L R A A V T P A A G V C A R

GGAGAAGCCCGAGGCTCTGTGGCGGCCCCGAGGAGGAGGACACAGACCCCGCTGCGTGGTGTGCTGCTCCCGCAGCAGCAGCGCTGCGAGGTGTAGCGCTCTGTGCCGCTG
E K P Q G S V A A P E E E D T D P R R L V Q L L R Q H S S P W Q V Y G F V R A C

CCTGCGCGGCTGGTGGCCCGAGGCTCTGGGCTCCAGGCAACAGAAAGCGGCTCTCTCAGGAACACCAAGAGTTTCTCTCCGGAAGCATGCAAGCTCTCGTGCAGGAGCT
L R R L V P P G L W G S R H N E R R F L R N T K K F I S L G K H A K L S L Q E L

GACGTGAAGATGAGCTGCGGAGCTGCGCTGGCTGCGCAGGAGCCAGGGGTGGCTGTTCCGCGCAGAGCACCGCTGCTGCTGAGGAGATCTGGCAGAGTCTCTGCACTGGCT
T W K M S V R D C A W L R R S P G V G C V P A A E H R L R E E I L A K F L H W L

GATGAGTGTGACGTGCTGAGCTGCTCAGGCTTTCTTTATGTACGAGACCAAGCTTTCAAAGAACAGGCTCTTTTCTACCGAAGAGTGTCTGAGCAAGTTCGCAAGCTTGG
M S V Y V L E L R S F F Y V T E T T F Q A K N R L F F Y R K S V W S K L Q S I G

AATCAGACACCACTGAAGAGGTGAGCTGCGGGAGCTGCGAAGCAGAGGTGAGGACGATCGGGAAGCAGGCGCGCTGCTGAGCTGCTCAGACTCTCGCTTATCCCCAAGCCTGA
I R Q H L K R V Q L R E L S E A E V R Q H R E A R P A L L T S R L R F I P K P D

CGGGCTGCGGCGATTGTGAACATGGAATACGCTGCTGGGAGCGAAGCGTTCGCGAGAGAAAGAGGGCGGCGCTCTACCTCGAGGGTGAAGGCACTGTTACAGCTGTCTCAACTACGA
G L R P I V N M D Y V V G A R T P R R E K R A E R L T S R V K A L F S V L N Y E

GCGGGCGGCGCGCCCGCTCTGGGCGCTCTGTGCTGGGCTGGAAGATATCCAGGGCGCTGCGGCACTTCTGCTGCTGCTGCGGGCCAGGACCGCGCGCTGAGCTGTACTT
R A R R P G L L G A S V L G L D D I H R A W R T F V L R V R A Q D P P P E L Y F

TGTCAAGGTGGATGTGACGGGCGCGTACGACACCATCCCCAGGACAGGCTCACGGAGGTATCGCCAGCATCATCAAAACCCAGAACAGTACTGCGTGGCTGGTATCGCGTGGTCCA
V K V D V T G A Y D T I P Q D R L T E V I A S I I K P Q N T Y C V R R Y A V V Q

GAAGCCCGCATGGGACGCTCCGCAAGGCTTCAAGAGCCAGCTCTACCTTACAGACAGCTCCAGCGGTACATGCGACAGTTCTGGTCTACCTGAGGAGACGCGCGCTGAGGGA
K A A H G H V R K A F K S H V S T L T D L Q P Y M R Q F V A H L Q E T S P L R D

TGCGGCTGCTATCGAGCAGAGCTCTCCCTGAATGAGGCGCAGGCTGGCTCTTTCAGGCTTCTCTACGCTTCTATGTCACACGCGGCTGCGCATCAGGGGCAAGCTCTACGCTCAGTG
A V V I E Q S S S L N E A S S G L F D V F L R F M C H H A V R I R G K S Y V Q C

CCAGGGATCCCGAGGCTTCTCTCTCCAGCTGCTCTGACGCTGTGCTACGGGACATGGAGAACAAAGCTGTTTGGGGGATTGCGGGGACGGGCTGCTCTCGGTTTGGTGA
Q G I P Q G S I L S T L L C S L C Y G D M E N K L F A G I R R D G L L L R L V D

TGATTTCTGTTGGTGACACTCACCTCACCCAGCGAAACCTTCTCAGGACCTGGTCCGAGGTGCTCCCTGAGTATGGCTGCGTGGTGAACTTGGGAAGACAGTGTGAACCTTCCC
D F L L V T P H L T H A K T F L R T L V R G V P E Y G C V V N L R K T V V N F P

TGTAGAAGACGAGGCGCTGGGTGGCAGGCTTTGTTTCAGATGCGGCGCCAGGCTATTCCTCTGGTGGCGCTGCTGCTGATACCGGACCTGGAGGTGAGAGCGACTACTCCAG
V E D E A L G G T A F V Q M P A H G L F P W C G L L L D T R T L E V Q S D Y S R

GTGAGCGACCTGGCGGAAGTGGAGCTGTGCCGCTGGGGCAGGTGCTGCTGACGGGCGTGGCTCCACTCTGCTTCCGTGCGGGCAGGCACTGCCAATCCCAAGGGTCAGA
TGCCACAGGGTGCCCCCTGCTCCATCTGGGGCTGAGCACAAATGCATCTTTCTGTGGAGTGAGGGTGCTCACAACGGGAGCAGTTTCTGTGCTATTTTGGTAA

FIG. 11G



Altered C-terminus protein

ATGCCGCGCGCTCCCGCTGCCGAGCCGTGCGCTCCCTGCTGCGCAGCCACTACCGCGAGGTGCTGCCGCTGGCCACGTCGCTG
M P R A P R C R A V R S L L R S H R E V L P L A T F V

CGCGCGCTGGGGCCCCAGGGCTGGCGCTGGTGACGCGGGGACCGCGCTTTCCGCGCGCTGGTGGCCAGTGCTGGTGGCTGGCCCTGGGACGACGCGCGCCCCCGCGCG
R R L G P Q G W R L V Q R G D P A A F R A L V A Q C L V C V P W D A R P P P A A

CCCTCCTTCCGCGAGGTGCTGCTGCTGAAGGAGCTGGTGGCCCCGAGTGCTGCGAGGCTGCTGCGAGCGCGCGGAGAAAGCTGCTGGCCTTCCGCTTCCGCTGCTGGACGGGGCCCG
P S F R Q V S C L K E L V A Q R L C E R G A K N V L A F G F A L L D G A R

CGGGGGCCCCCGAGGCTTACCACGAGCTGCGCAGCTACCTGCCAACACGCTGACCGGAGCGCGGGGAGCGGGGCTGGGGCTGCTGCTGCGCGCGCTGGGGGAGCGAGCT
G G P P E A F T T S V R S Y L P N T V T D A L R G S G A W G L L L R R V G D D V

GCTGGTTACAGTGGCAGCTGCGCGCTCTTTGTGCTGGTGGCTCCAGCTGCGCCTACAGGTGCTGCGGGCGCGCTGTACCAGCTCGGCGCTGCCACTCAGGCCCGCGCCCCCGCC
L V H L L A R C A L F V L V A P S C A Y Q V C G P P L Y Q L G A A T Q A R P P P

ACACGCTAGTGACCCGGAAGGCTGCTGGGATGCGAACCGGCTGGAACCATAGCGTCAGGAGCGCGGGTCCCCCTGGGCTGCCAGCCCCGGGTGCGAGGAGCGCGGGGCGAGTGC
H A S G P R R R L G C E R A W N H S V R E A G V P L G L P A P G A R R R H G S A

CAGCCGAAGTCTGCGTGGCCAAAGAGGCCAGGCTGGCGCTGCCCTGAGCGGAGCGAGCGCGCTTGGGAGGGGCTGGGGCCACCGGGGAGGAGCGCTGGAACGAGTACCG
S R S L P L P K R P R R G A A P E P E R T P V G Q G S W A H P G R T R G P S D R

TGGTTTCTGTGGTGGTCACTGCGCAGACCCGCGGAAGACCACTCTTTGGAGGGTGGCTCTCTGCGCAGCGCCACTCCACCCATCGTGGGCGCGCAGCACACCGGGCCCCC
G F C V V S P A R P A E E A T S L E G A L S G T R H S H P S V G R Q H H A G P P

ATCCACATCCGCGCCACGCTCCCTGGGACACGCTTGTCCCGGTGTGCGGAGCAGCAAGCACTTCTCTACTCTCAGGCGACAAGGAGCAGCTGCGGCGCTCTCTACTCAG
S T S R P P R P W D T P C P P V Y A E T K H F L Y S S G D K E Q L R P S F L L S

CTCTCTGAGGCCAGCTGACTGCGGCTCGGAGGCTCGTGAGACCATCTTTCTGGTTCAGGCGCTGGATGCCAGGACTCCCCGAGGTGCGCGCGCTGCCAGCGCTACTGGCA
S L R P S L T G A R R R L V E T I F L G S R P W M P G T P R R L P R L P Q R Y W Q

AATGCGGCCCTGTTCTGAGCTGCTTGGGAACACGCGCAGTGCCCTTACGGGTGCTCTCTAAGACGCACTGCCCGCTGCGAGCTGCGGTCACCGAGCAGCGGTGCTGTGCGCC
M R P L F L E L N H A C P Y G L T H C P L R A A V T P A R R R H G S A

GGAGAAGCCCGAGGCTCTGTGGCGGCCCGAGGAGGAGGACACAGACCCCGTGCCTGGTGGTGGTCTGCTCGCGCAGCAGCAGCGCCCTGGCAGGTGTACGGCTCTGTGCGGGCTG
E K P Q G S V A A P E E E D T D P R R L V Q L L R Q H S S P W Q V Y G F V R A C

CTGCGCGCGCTGGTGGCCCGAGGCTTGGGCTCCAGGCAACGAAAGCGCTTCTCAGGAACACCAAGAGTTCATCTCCCTGGGGAAGCATGCCAAGCTCTCGTGCAGGAGCT
L R R L V P P G L W G S R H N E R R F L R C T K K F I S L G K H A K L S D G A R

GACGTGGAAGATGAGCTGCGGAGCTGCGCTGGCTGCGCAGGAGCCAGGGGTGGCTGTGTCGCGCGCAGAGCACGCTCTGCTGAGGAGATCTGCGCAAGTTCCTGCACTGGCT
T W K M S V R D C A W L R S P G V G C V P A A E H R L R E E I L A K F L H W L

GATGAGTGTGTACGCTGCTGAGCTGCTCAGGTCTTTCTTTATGTACGAGAGCACGCTTCAAAAGAACAGGCTCTTTTCTACCGGAAGAGTGTCTGGAGCAAGTTCGAAAGCATTGG
M S V Y V V E L L R S F F Y V T E T T F Q K N R L F F Y R K S V W S K L Q S I G

AATCAGACAGCACTGAAGAGGGTGCAGCTGCGGAGCTGTCGGAAGCAGGTCAGGACGATCGGGAAGCAGGCGCGCTGCTGACGCTCCAGACTCCGCTTCATCCCAAGCCTGA
I R Q H L K R V L R E L S E A E V R G H R E A R P A L L T S R L R F I P K P D

CGGGCTGCGGCGATTGTGAACATGGACTACGCTGCGGAGCCAGAACGTTCCGCGAGAGAAAGAGGGCGGAGCGCTCTACCTCGAGGGTGAAGGCACTGTTACAGCTGCTCAACTACGA
G L R P I V N M D Y V V G A R T F R R E K R A E R L T S R V K A L F S V L N Y E

GCGGGCGCGCGCGCGCTCTGCGGCGCTCTGCTGGGCTGGACGATATCCACAGGCGCTGGCGCACCTCGTGTGCTGCGGGCGGAGGACCGCGCGCTGAGCTGACTT
R A R R L S V L G L D D I H R A T F V L R V R A Q D P P P E L Y F

TGTCAAGGTGGATGTGACGGCGCGTACGACACCATCCCGCAGGAGCTACGAGGCTATCGCCAGCATCAAAACCCAGAACAGTACTGCGTGGTGGTATCGGCTGGTCCA
V K X D V T G A Y D T I P Q D R L T E V I A S I I K P Q N T Y C V R R Y A V V Q

GAAGGCCCGCATGGGACGCTCCGCAAGGCTTCAAGAGCCAGTCTCTACCTTGACAGACCTCCAGCGGTATCGGACAGTCTGCTGGCTCACTGAGGAGACCGCGCTGAGGGA
K A A H G H V R K A P K S H V S T L T D L Q P Y M R Q F V A H L Q E T S P L R D

TGCCGCTGCTATCGAGCAGAGCTCTCCCTGAATGAGGCGCAGTGGGCTCTTCGAGCTCTCTACGCTTTCATGTGCCACACGCGCTGGCATCAGGGCAAGTCTTACGCTCAGTG
A V V I E Q S S L N E A S S G L F D V F L R F M C H H A V R I R G K S Y V Q C

CCAGGGGATCCCGAGGCTCCATCTCTCCAGCTGCTCTGACGCTGTGCTACGGGACATGGAGAACAGCTGTTTGGGGGATTGGGGGAGCGGGCTGCTCTGCGTTTGGTGGGA
Q G I P Q G S I L S T L L C S L C Y G D M E N K L F A G I R R D G L L L R L V D

TGATTCTTGTGGTGAACCTCACTCACCACGCGAAACCTTCTCAGGACCTGGTCCGAGGTGCTCCCTGAGTATGGCTGCTGGTGAAGTTCGCGGAAGCAGTGGTGAAGTCTCC
D F L L V T P H L T H A K T F L R T L V R G V P E Y G C V V N L R K T V V N F P

TGTAGAAGACGAGGCTTGGTGGCAGGCTTTTGTTCAGATGCGGCGCAGGCTATTCCCTGGTGGCGCTGCTGCTGATACCGGACCGTGGAGGTGAGAGGAGTACTCCAG
V E D E A L G G T A F V Q M P A H G L F P W C G L L L D T R T L E V Q S D Y S S

CTATGCCCGGACCTCCATCAGAGCCAGTCTCACCTTCAACCGCGCTTCAAGGCTGGGAGGAAACATGCTGCGAAACTCTTTGGGGTCTTGGCGCTGAAGTGTACAGCTGTTTCTGGA
Y A R T S I R A S L T F N R G F K A G R N M R R K L F G V L R L K C H S L F L D

TTTGAGGTGAACAGCTCCAGACGCTGTCACCAACATCTCAAGATCTCTGCTGCGAGGCTGACAGGTTTACAGCATGTGTGCTGACAGCTCCCATTTTCATCAGCAAGTTTGAAGAA
L Q V N S L Q T V C T N I Y K I L L L Q A Y R P H A C V L Q L P F H Q Q V W K N

CCCCATTTTCTGCGCGCTCATCTCTGACACGGCTCCCTCTGCTACTCCATCTGAAAGCCAAAGACGAGGATGCTGCTGGGGCCAAGGGCGCGCGCGCTCTGCGCTCCGA
P T P F L R V I S D T A S L C Y S I L K A K N A E

CGAAGAAAACATTTCTGCTGCTGACTCTGCGGTGCTTGGGT
E E N I L V V T P A V L G S

GGGACAGCAGAGATGGAGCCACCGCGCAGCGTGGGTGGGCGAGCTTCCGGTGTCTCTGGAGGGAGTGGGCTGGGCTGCTGACTCTCAGCTCTGTTTCCCCCGAG
G Q P E M E P P R R P S G V G S F P V S P G R G V G L G L *

FIG. 11H

FIG. 11J



Lacks motif A and altered C-terminus

ATGCCGCGCGCTCCCGCTGCCGAGCCGTCGCTCCCTGCTGCGCAGCCACTACCGGAGGTGCTGCGCTGGCCACGTCGTC
M P R A P R C R A V R S L L R S H R E V L P L A T F V

CGGCGCTGGGCCCCAGGGCTGGCGCTGGTGACGCGGGGACCCGGCGCTTTCGCGCGCTGGTGGCCAGTGCCTGGTGTGCTGGCTGGGACGACGCGCGCCCCCGCGC
R R L G P Q G W R L V Q R G D P A A F R A L V A Q C L V C V P W D A R P P P A A

CCCCCTCTTCCCGAGGTGCTGCTGAAGGAGCTGCTGGCCGAGTGTGACAGGCTGTGCGAGCGCGCGGGAAGAACGTCGCTGGCTTCCGCTGCTGGACGGGGCCCG
P S F R Q V S C L K E L V A R V L Q R L C E R G A K N V L A P G F A L L D G A R

CGGGGGCCCCCGAGGCTTACCACACGCTGGCGAGTACCTGCCCAACACGCTGACCGACCTGCGGGGAGCGGGGCTGGGGGCTGCTGCTGCGCGCTGGCGACGACGCT
H G P P E A F T T S V R S Y L P N T V T D A L R G S G A W G L L L R R V G D D V

GCTGGTTCACCTGCTGGCAGCTGCGCGCTCTTTGTGCTGGTGGTCCAGCTGCGCTACAGGTGTGGGGCGCGCGCTGTACAGCTCGGGCTGCCACTAGGCCCGCCCCCGC
L V H L L A R C A L F V L V A P S C A Y Q V C G P P L Y Q L G A A T Q A R P P P

ACAGCTAGTGACCCGAGGCGCTGGGATGCGAACCGGCTGGAACCATAGCGTCAGGGAGCGGGGTCCCCCTGGGCTGCCAGCCCCGGGTGCGAGGAGCGCGGGGCGAGTGC
H A S G P R R R L G C E R A W N H S V R E A G V P L G L P A P G A R R R H A G S A

CAGCGAAGTCTGCGTGGCCAGGAGCGCGCTGGCGCTGCGCTGAGCGGAGCGGACCGCGTGGCGAGGGTCTGGGCCACCCCGGCGAGGACGCTGGAACGAGTACCG
S R S L P L P K R P R R G A A P E P E R T P V G Q G S W A H P G R T R G P S D R

TGGTTCTGTGTGTGTGCTGCTGACGACCGCGGAGGAGCCACTCTTGGAGGGTGGCTCTCTGGGACGCGCCACTCCACCCATCGTGGGCGCGCAGCACCAACGCGGGCCCCC
G F C V V S P A R P A E E A T S L E G A L S G T R H S H P S V G R Q P P R R R V G D D V

ATCCATCCTGCGGCCACGCTCCCTGGGACACGCTTGTCCCGCGGTGACCGGAGACCAAGCAGTCTCTCTACTCTCAGGCGACAGGAGCAGCTCGGGCTCTCTCTACTCAG
S T S R P P R P W D T P C P P V Y A E T L K H F L Y S S G D K E Q L R P S P L L S

CTCTGAGGCGCCAGCTGAGTGGCGCTCGGAGGCTCGTGAGACCATCTTTCTGGGTTCAGGCGCTGATGCCAGGACTCCCCGAGGTTCGCCCGCTGCCAGCGCTACTGGCA
S L R P S L T G A R R R L V E T I F L G S R P W M P G T P R R L P R L P Q R Y W Q

AATGCGGCCCTGTTCTGAGCTGCTGGGAACCAACGCGAGTGCCTTACGGGTGCTCTCAAGACGCACTGCCCGTGGAGCTGCGGTACCCACGAGCGGGTGTGTGCGCG
M R P L F L E L L N H A Q C P Y G V L L K T H C P L R A A V T P A P G A R R R H A G S A

GGAGAAGCCCGAGGCTCTGTGGCGGCCCGGAGGAGGACACAGACCCCGTGGCTGGTGCAGCTGCTCGGCGAGCACAGCAGCCCTGGCAGGTGTACGGCTCTGTGCGGGCTG
E K P Q G S V A A P E E E D T D P R R L V Q L L R Q H S S P W Q V Y G F V R A C

CCTGCGCGGCTGCTGCGCCAGGCTCTGGGCTCAGGCAACGAGCGCGTCTCAGGAAACCAAGAGTTCATCTCCCTGGGGAAGCATGCCAAGCTCTCGTGCAGGAGCT
L R R L V P P G L W G S R H N E R R P L R N T K K F I S L G K H A K L S L Q E L

GACGTGGAAGATGAGCTGCGGAGTCTGCGCTGGCTGCGGAGGCGCGGGTGGCTGTGTTCCGCGCAGAGCAGCTCTCGTGAAGGATCTCGGCAAGTTCCTGCTGCTGGCT
T W K M S P R R S P A W L R E L S E A E V R G C V A A E H R L R E E I L A K F L H W L

GATGAGTGTGATCGTCTGAGCTGCTCAGGCTCTTCTTTATGTACGAGAGACCGTTCCTCAAGAACAGGCTCTTTTCTACCGGAAGAGTGTCTGGAGCAAGTTCGCAAGCATTGG
M S V Y V V E L L R S F F Y V T E T T F Q K N R L P F F Y R K S V W S K L Q S I G

AATCAGACGCACTGAAGAGGGTGCAGCTGCGGGAGCTGCGGAAGCAGGTCAGGACGATCGGGAAGCAGGCGCGCTGCTGACGCTCCAGACTCCGCTTCATCCCAAGCCTGA
I R Q H L K R V Q L R E L S E A E V R G C V A A E H R P A L L T S R L R F I P K P D

CGGGCTGCGGCGATTGTGAACATGGAATCGTCTGGGAGCGAGACGTTCCGAGAGAAAGAGGGCGAGCGTCTACCTCGAGGGTGAAGGCACTGTTCAGCTGTCTCAACTACGA
G L R P I V N M D Y V V G A R T F R R E K R A E R L T S R V K A L F S V L N Y E

GCGGCGCGGCGCGCGGCTCTGCGGCGCTCTGTGCTGGGCTGGACGATATCCACAGGGCTGCGGCACTCTGCTGCTGCGGTGCGGGCCAGGACCCCGCGCTGAGCTGTACTT
R A R R P G L L G A S V L G L D D I H R A W R T F V L R V R A Q D P P P E L Y F

TGTCAAG
V K GACAGGCTACGGAGGTCATCGCCAGCATCATCAAAACCCAGAACGTACTGCGTGGTGGTATCGCGTGGTCCA
D R L T E V I A S I I K P Q N T Y C V R R Y A V V Q

GAAGGCCGCCATGGGACGTCGCGAAGGCTTCAAGAGCCAGCTCTACCTTGACAGACCTCAGCGGTATCATGGACAGTTCGTGCTCAGCTGACGAGACGAGCCCGCTGAGGGA
K A A H G H V R K A F K S H V S T L T D L Q P Y M R Q F V A H L Q E T S P L R D

TGCGGTCTCATCGAGCAGAGCTCTCCCTGAATGAGGCCAGTGGCGCTCTTCAGCTCTTCATGCTGACCAACGCGGTGCGCATCAGGGCAAGTCTTACGTCAGTG
A V V I E Q S S L N E A S S G L F D V F L R F M C H H A V R I R G A K S Y V Q C

CCAGGGGATCCCGAGGCTCCATCTCTCCAGCTGCTCTGACGCTGTGCTACGGGACATGGAGAACAGCTGTTTGGGGGATTGCGGGGACGGGCTGCTCTGCGTTTGGTGA
Q G I P Q G S I L S T L L C S L C Y G D M E N K L F A G I R R D G L L L R L V D

TGATTTCTGTGGTGAACCTCACTCACCACGCAAACTTCTCAGGACCTGGTCCAGGTGCTCCCTGAGTATGGCTGCGTGGTGAAGTTCGCGGAAGCAGTGTGAAGTCTCC
D F L L V T P H L T H A K T F L R T L V R G V P E Y G C V V N L R K T V V N P P

TGTAGAAGACGAGGCCCTGGGTGACGCGCTTTGTTCAGATGCGGCGCCAGGCTATTCCTCGTGGGCTGCTGCTGATACCGGACCTGAGGTGACAGCGACTACTCCAG
V E D E A L G G T A F V Q M P A H G L F P W C G L L L D T R T L E V Q S D Y S S

CTATGCCGCGACCTCCATCAGAGCCAGTCTCACCTTCAACCGCGCTTCAAGCTGGGAGAACATCGCTGCAAACTCTTTGGGCTCTTGGGCTGAAGTGTACAGCGCTGTTCTGGA
Y A R T S I R A S L T P N R G F K A G R N M R R K L F G V L R L K C H S L P L D

TTTGACAGTGAACGCTCCAGACGCTGTGACCAACATCTACAAGATCTCTGCTGACGCGTACAGGTTTACAGCATGTGTGCTGACAGCTCCCATTTTCATCAGCAAGTTTGAAGAA
L Q V N S L Q T V C T N I Y K I L L Q A Y R P H A C V L Q L P P H Q Q V W K N

CCCCCATTTTCTGCGCGCTCATCTCTGACACGCGCTCCCTCTGCTACTCCATCTGAAAGCCAAAGACGAGGATGTCGCTGGGGCCAGGGGCGCGCGCGCTCTGCGCTCCGA
P T F F L R V I S D T A S L C Y S I L K A K N A E

CCGAAGAAAAACATTTCTGTCGTGACTCTGCGGTGCTTGGGTG
E E N I L V V T P A V L G S

GGGACAGCAGAGATGGAGCCACCCGAGACCGTGGGTGTGGGAGCTTTCGGTGTCTCTGGGAGGGAGTGGGCTGGGCTGTGACTCTCAGCTCTGTTTCCCCCAG
G Q P E M E P P R R P S G V G S F P V S P G R G V G L G L *

FIG. 11K



domain

N-terminal truncated telomerase (ver. 2)

ATGCCGCGCGCTCCCCGCTGCCGAGCGGTGCGCTCCCTGCTGCGCAGCCACTACCGCGAGGTGCTGCCGCTGGCCACGTTGCTG
M P R A P R C R A V R S L L R S H R E V L P L A T F V
CGGCGCTGGGGCCCCAGGGCTGGCGGCTGGTGACGCGGGGACCCGCGGCTTTCCGCGCGCTGGTGGCCAGTGCTGGTGGCTGGCTGGGACGACGCGCGCCCCCGCGCG
R R L G P Q G W R L V Q R G D P A A F R A L V A Q C L V C V P W D A R P P P A A
GGCTCCCGGGGTGCGCGCTGCGGTGGGTTGAGGGCGCGGGGGGAACAGCGACATGCGGAGAGCAGCGCAGGCGACTCAGGGCGCTTCCCGCGAGTG
G L P G V G V R L G L R A A G G N Q R H A E S S A G D S G R F P R R
A S P G S A S G W G * G R P G G T S D M R R A A Q A T Q G A S P A G
P P R G R R P A G V E G G R G E P A T C G E Q R R R L R A L P P Q V
CCCCCTCTTCCCGAGGTGCTGCTGAAGGAGCTGGTGGCCGAGTGCTGACAGAGCTGTGCGAGCGCGCGCGAAGAACGTGCTGGCCTTCCGCTTCCGCTGCTGACGGGGCCCC
P S F R Q V S C L K E L V A R V L Q R L C E R G A K N V L A F G F A L L D G A R
CGGGGGCCCCCGAGGCTTACACACAGCGTGCGCAGCTACCTGCCCAACAGGTGACCGACGCACTGCGGGGAGCGGGCGTGGGGCTGCTGCTGCGCGCTGGGGCAGCAGCT
H G P P E A F T T S V R S Y L P N T V T D A L R G S G A W G L L L R R V G D D V
GCTGGTTCACTGCTGGCAGCTGCGCGCTCTTGTGCTGGTGGCTCCAGCTGCGCTACAGGTGTGCGGGCGCGCGTGTACAGCTCGGGCTGCCACTCAGGCGCGCCCCCGC
L V H L L A R C A L F V L V A P S C A Y Q V C G P P L Y Q L G A A T Q A R P P P
ACAGCTAGTGAGCCCGAAGCGCTGTGGGATGCGAAGCGGCTGGAACATAGCGTCAGGGAGCGCGGGCTCCCGCTGGGCTGCCAGCCCCGGGTGCGAGGAGCGCGGGGCGAGTG
CAGCGAAGTCTGCGTGGCCAGAGCGCGAGCGTGGCGTGGCCCTGAGCGGAGCGGACCGCGTGGGCGAGGGCTCTGGGCGCACCGGGCAGGACGCGTGAGCGGAGTGACCG
S R S L P L P K R P R R G A A P E P E R T P V G Q G S W A H P G R T R G P S D R
TGGTTCTGTGGTGTACCTGCCAGACCCGCGAAGAGCCACCTCTTTGAGGGGTGCGCTCTCTGGCAGCGCCACTCCACCCATCCGTGGGCGCGCAGCACCGCGGGCCCCC
G F C V V S P A R P A E E A T S L E G A L S G T R H S H P S V G R Q H H A G P P
ATCCACATCGCGCCACACGCTCCCTGGGACAGCGCTTGTCCCGCGGTGACGCGGAGACCAAGCACTTCTCTACTCTCAGGCGACAAGGAGCAGCTGCGGCGCTCTCTACTCAG
S T S R P P R P W D T P C P P V Y A E T K H F L Y S S G D K E Q L R P S F L L S
CTCTGAGGCGCCAGCTGACTGGCGCTCGGAGGCTCGTGAGACCATCTTTCTGGGTTCAGGCGCTGGATGCCAGGAGCTCCCGCAGGTGCGCGCGCTGCGCCAGCGCTACTGGCA
S L R P S L T G A R R L V E T I F L G S R P W M P G T P R R L P R L P Q R Y W Q
AATGCGGCGCTGTTCTGAGCTGCTTGGGAACACGCGCAGTGCCCTACGGGGTGCTCTCAAGACGCACTGCCGCTGCGAGCTGCGGTACCCACAGCAGCGGTGTCTGTGCGCG
M R P L F L E L L G N H A Q C P Y G V L L K T H C P L R A A V T P A A G V C A R
GGAGAAGCCCGAGGCTCTGTGGCGGCCCCGAGGAGGAGGACACAGACCCCGTGGCTGGTGAGCTGCTCCGCGCAGCAGCAGCGCTGGCAGGTGTACGGCTTCTGTGGGGCTG
E K P Q G S V A A P E E E D T D P R R L V Q L L R Q H S S P W Q V Y G F V R A C
CTTGGCGCGCTGGTCCCCAGGCTCTGGGCTCAGGCAACAGCGCGCTTCTCAGGAACACCAAGAGTTCTCTCCCTGGGGAAGCATGCCAAGCTCTCGTGCAGGAGCT
L R R L V P P G L W G S R H N E R R F L R N T K K F I S L G K H A K L S L Q E L
GACGTGGAAGATGAGCGTGGGAGCTGCGCTTGGCTGCGCAGGAGCGCGGGTGGCTGTGTTCCGGCGCAGACCGCTCTGCTGAGGAGATCTGGCAAGTTCTGCACTGGCT
T W K M S V R D C A W L R R S P G V G C V P A A E H R L R E E I L A K P L H W L
GATGAGTGTGACGTGCTGAGCTGCTCAGGTCTTTCTTTATGTACGAGAGACCGTTTCAAGAAAGAGGCTCTTTTCTACCGGAAGAGTGTCTGGAGCAAGTTGCAAGCAATTGG
M S V Y V V E L L R S F F Y V T E T T F Q K N R L P F Y R K S V W S K L Q S I G
AAT - NNN - GACAGTCACAGGGGGGTGACCGCGGAGTGGCGCTCCCGAGGTTGACTATAGGACAGGTGTCCAGGTGCCCTGCAAGTAGAGGGGCTCTCAGAGGCGCTGGCTGG
CATGGGTGGAGTGGCCCCGGCATGGCTTCTGCGTGTGCTGCCGTGGGTGCCCTGAGCCCTCACTGAGTCGGTGGGGCTTGTGGCTTCCCGTGAGCTTCCCGCTAGTCTGTGTCTG
GCTGAGCAAGCTCTGAGGGGCTCTCTATTG-

FIG. 11L



Truncated protein 1 (ver. 2)

ATGCGCGCGCTCCCGCTGCCGAGCCGTGCGCTCCCTGCTGCGCAGCCACTACCGGAGGTGCTGCCGCTGGCCACGTTGCTG
M P R A P R C R A V R S L L R S H R E V L P L A T F V

CGGCGCTGGGGCCCCAGGGCTGGCGGCTGGTGACGCGGGGACCGGCGGCTTTCCGCGCGCTGGTGGCCAGTGCGTGGTGGCTGGCCCTGGGACGCAACGGCGCCCCCGCGC
R R L G P Q G W R L V Q R G D P A A F R A L V A Q C L V C V P W D A R P P P A A

GGCTCCCGGGGTCCGCTCCGCTGGGTTGAGGGCGCGGGGGGAACACGACATGCGGAGAGCAGCGCAGGCGACTCAGGGCGCTTCCCGCGAGGTG
G L P G V G V R L G L R A A G G N Q R H A E S S A G D S G R F P R R
A S P G S A S G W G * G R P G G T S D M R R A A Q A T Q G A S P A G
P P R G R R P A G V E G G R G E P A T C G E Q R R R L R A L P P Q V

CCCCCTCTCCCGCAGGTGCTGCTGAAGGAGCTGGTGGCCGAGTGCTGACAGAGGCTGTGCGAGCGCGCGCGAAGAACGTGCTGGCTTCGGCTTCGCGCTGTGGACGGGGCCCCG
P S F R Q V S C L K E L V A R V L Q R L C E R G A K N V L A F G F A L L D G A R

CGGGGGCCCCCGAGGCTTACCAACAGCGTGGCGAGCTACCTGCCCAACACGGTGACCGACGCACTGCGGGGAGCGGGGCGTGGGGGCTGCTGCTGCGCCGCTGGGGCAGCAGCT
G G P P E A F T T S V R S Y L P N T V T D A L R G S G A W G L L L R R R V G D D V

GCTGGTTACCTGCTGGCAGCTGCGCGCTCTTTGCTGGTGGCTCCAGCTGCGCCTACCAAGTGTGCGGGCGCGCGCTGTACCACTGCGCGCTGCCACTCAGGCCCGCCCCCGCC
L V H L L A R C A L F V L V A P S C A Y Q V C G P P L Y Q L G A A T Q A R P P P

ACACGCTAGTGGACCCCGAAGCGCTCTGGGATGCGAAGCGGCTGGAACATAGCGTCAGGGAGCGGGGTCCTCCCTGGGCTGCCAGCCCCGGGTGCGAGGAGCGCGGGGGCAGTGC
H A S G P R R R L G C E R A W N H S V R E A G V P L G L P A P G A R R R G G S A

CAGCGAAGTCTGCGTGGCCAGAGCGCCAGGCGTGGCGCTGCCCTGAGCGGAGCGAGCGCGCTGGGCGAGGGTCTGGGCCACCGGGCAGGACGCGTGGACCGAGTGACCG
S R S L P L P K R P R R G A A P E P E R T P V G Q G S W A H P G R T R G P S D R

TGGTTTCTGTGTGTGCTCACTGCCAGACCCCGCAAGAAGCCACTCTTTGGAGGGTGGCTCTCTGCGCAGCGCCACTCCACCCATCCGTGGGCGCGCAGCACCGCGGGCCCCC
G F C V V S P A R P A E E A T S L E G A L S G T R H S H P S V G R Q H H A G P P

ATCCACATCGCGGCCACCACTCCCTGGGACACGCTTGTCCCCGGTGTACCGCGAGACCAAGCACTTCTCTACTCTCAGGCGCAAGGAGCAGCTGCGGCCCTCTCTACTCAG
S T S R P P P R P W D T P C P P V Y A E T K H F L Y S S G D K E Q L R P S F L L S

CTCTCTGAGGCCACGCTGACTGCGCTCGGAGGCTCGTGGAGACCATCTTTCTGGGTTCCAGGCCCTGGATGCCAGGGACTCCCGCAGGTGCCCCGCTGCCCGAGCGCTACTGGCA
S L R P S L T G A R R L V E T I F L G S R P W M P G T P R R L P R L P Q R Y W Q

AATGCGGCCCTGTTTCTGAGCTGCTTGGGAACACGCGCAGTGCCCTACGGGGTGTCTCTCAAGACGCACTGCCCGCTGCGAGCTGCGGTACCCACAGCAGCGGTGCTGTGCCCC
M R P L F L E L L G N H A Q C P Y G V L L K T H C P L R A A V T P A A G V C A R

GGAGAAGCCCGAGGCTCTGTGCGGCCCCGAGGAGGAGGACACAGACCCCGTGGCTGGTGAGCTGCTCCGCGAGCACAGCAGCCCTGGCAGGTGTACGGCTTCTGCGGGGCTG
E K P Q G S V A A P E E E D T D P R R L V Q L L R Q H S S P W Q V Y G F V R A C

CCTGCGCGGCTGGTGGCCCCAGGCTCTGGGGTCCAGGCACAACGAACGCGCTTCTCAGGAACACCAAGAAGTTCATCTCCCTGGGAAGCATGCCAAGCTCTCGCTGAGGAGCT
L R R L V P P G L W G S R H N E R R F L R N T K K F I S L G K H A K L S L Q E L

GACGTGGAAGATGAGCGTGGGACTGCGCTTGGCTGCGCAGGAGCCAGGGTGGCTGTGTTCCGGCGCAGAGCACCGCTGCGTGAGGAGATCCTGGCCAAGTTCCTGCACTGGCT
T W K M S V R D C A W L R R S P G V G C V P A A E H R L R E E I L A K F L H W L

GATAGTGTGTACGTCGTCGAGCTGCTCAGGTCTTTCTTTATGTACGAGAGCACGTTTCAAAAGAACAGGCTCTTTTCTACCGGAAGAGTGTCTGGAGCAAGTTGCAAGCATTGG
M S V Y V V E L L R S F F Y V T E T T F Q K N R L P F Y R K S V W S K L Q S I G

AATCAGACGCACTTGAAGAGGGTGCAGCTGCGGGAGCTGTGGAAGCAGAGGTGAGGACGATCGGGAAGCCAGGCCCCCTGCTGACGCTCCAGACTCCGCTTCATCCCAAGCCTGA
I R Q H L K R V Q L R E L S E A E V R Q H R E A R P A L L T S R L R F I P K P D

GTGGCTGCTTTGGTTTAACTTCTTTTAAACAGAA
V A V L W F T F L F N Q K

CGGGCTGCGGCGGATTGTGAACATGGACTACGTCGTGGGAGCCAGAACGTTCCGAGAGAAAGAGGGCGGCGCTCACCTCGAGGGTGAAGGCACTGTTACGCGTCTCAACTACGA
G L R P I V N M D Y V V G A R T F R R E K R P S V S F R G *



Truncated protein 2 (ver. 2)

ATGCCGCGCGCTCCCGCTGCCGAGCCGTCGCTCCCTGCTGCGCAGCCACTACCGGAGGTGCTGCCGCTGGCCACGTTCTGT
M P R A P R C R A V R S L L R S H R E V L P L A T F V

CGGCGCTGGGGCCCGAGGGCTGGCGGCTGGTGAGCGGGGACCCGCGGCTTTCGCGCGCTGGTGGCCAGTGCTGGTGTGCGTGGCTGGGACGACGCGCGCCCGCCCGCGC
R R L G P Q G W R L V Q R G D P A A F R A L V A Q C L V C V P W D A R P P P A A

GGCCTCCCGGGGTCGCGTCCGCTGGGTTGAGGGCGCGCGGGGAACAGCGCATGCGGAGAGCAGCGCAGGCACTCAGGGCGCTTCCCGCGCAGGT
G L P G V G V R L G L R A A G G N O R H A E S S A G D S G R F P R R
A S P G S A S G W G * G R P G G T S D M R R A A Q A T Q G A S P A G
P P R G R R P A G V E G G R G E P A T C G E Q R R R L R A L P P Q V

CCCCCTCTCCGCCAGGTGTCTGCTGAAGGAGCTGGTGGCCGAGTGTGACAGGCTGTGCGAGCGCGCGGAAGAACGTGCTGGCCTTCGGCTTCGCGCTGTGAGCGGGCCCG
P S F R Q V S C L K E L V A R V L Q R L C E R G A K N V L A F G F A L L D G A R

CGGGGCGCCCGGAGGCTTACCAACAGCGTGCAGCTACCTGCCCAACAGGTGACCGACGCTGCGGGGAGCGGGGCTGGGGCTGCTGCTGCGCGCTGGGGCAGCAGCT
G G P P E A F T T S V R S Y L P N T V T D A L R G S G A W G L L L R R V G D D V

GCTGTTTACCTGCTGGCAGCTGCGGCTCTTTGCTGGTGGCTCCAGCTGCGCTACAGGTGTGCGGGCGCGCTGTACAGCTGCGGCTGCGCACTCAGGCGCGCCCGCCCGC
L V H L L A F L V L V A P S C G G P P L Y Q L G A A T Q L A R R V G D D V

ACAGCTAGTGAGCCCGAAGGCTGTGGATGCGAAGCGGCTGGAACTAGCGTCAGGAGGCGGGGCTCCCTGGGCTGCGAGCCCGGCTGCGAGGAGGCGGGGCGAGTGC
H A S G P R R R L G C E R A W N H S V R E A G V P L G L P A P G A R R R R G G S A

CAGCGAAGTCTGCGCTTCCCAAGAGCGCGGCTGGCGCTGCCCTGAGCGGAGCGAGCGCGCTTGGGAGGGGCTGGGCGCCACCGGCGAGGAGCGCTGGAGCGAGTGACCG
S R S L P L P K R P R R G A A P E P E R T P V G Q G S W A H P G R T R G P S D R

TGCTTTCTGTGTGTGCTACCTGCCAGCAGCGCGAAGAACCACTCTTTGGAGGGTGGCTCTCTGCGCAGCGCCACTCCCACTCATCGTGGGCGCGCAGCAGCAGCGGGCCCGC
G F C V V S P A R P A E E A T S L E G A L S G T R H S H P S V G R G R G R P P P

ATCCACTGCGGCGCCACCGTCCCTGGGACAGCGCTGTGCTCCCGGTGTACGCGGAGCAGCAAGCACTTCTCTACTCTCAGGCGCAAGGAGCAGCTGCGGCGCTCTCTACTCAG
S T S R P P P R P W D T P C P P V Y A E T K H F L Y S S G D K E Q L R P S P L L S

CTCTGAGGCGCCAGCTGAGTGGCGCTGCGAGGCTCGTGAGACCATCTTTCTGGGTTCAGGCGCTGGATGCGAGGACTCCCGCAGGTGCGCCGCTGCGCCAGCGCTACTGGCA
S L R P S L T G A R R L V E T I F L G S R P W M P G T P R R L P R L P Q R Y W Q

AATCGGCGCGCTGTTCTGAGCTGCTTGGGAACACGCGAGTGCCTTACGGGTGCTCTCAAGACGCACTGCGCGTGCAGCTGCGGTACCCAGCAGCGCGGTGTGTGCGCG
M R P L L F L E L L G N H A Q C P Y G V L L K T H C P L R A A V T P A A G V C A R

GGAGAAGCGCGGCTCTGTGGCGCGCCCGGAGGAGGACACAGACCCCGTGCCTGTGTCAGCTGCTCCGCGAGCAGCAGCGCGCTGGCAGGTGTACGGCTTCGTGCGGCGCTG
E K P Q G S V A A P E E E D T D P R R L V Q L L R Q H S S P W Q V Y G F V R A C

CCTGCGCGGCTGGTGGCGCGCGCTTGGGCTCCAGGCAACAAGCGCGCTTCTCAGGAACACCAAGAGTTTCTCTCCCTGGGGAAGCATGCCAAGCTCTCGTGCAGGAGCT
L R L P P G L W S R H N E R R F L R N T K K F I S L G K H A K L S L F Q R Y W Q

GACGTGGAAGATGAGCTGCGGACTGCGCTTGGCTGCGCAGGAGCCAGGGGTGGCTGTGTTCCGGCGCAGAGCACCGCTGCGTGAGGAGATCCTGGCAAGTTCTGCACTGGCT
T W K M S V R D C A W L R R S P G V G C V P A A E H R L R E E I L A K F L H W L

GATGAGTGTGCTGCTGAGCTGCTCAGGCTTTCTTTATGTACAGGAGACCAAGTTTCAAAAGAACAGGCTCTTTTCTACCGGAAGAGTGTCTGAGCAAGTTGCAAGCATTGG
M S V Y V V E L L R S F P Y V T E T T F Q K N R L F F Y R K S V W S K L Q S I G

AATCAGACAGCACTTGAAGAGGTGAGCTGCGGAGCTGTGGAAGCAGAGTTCAGGCAAGTTCAGGCGCGCGCTGCTGAGCTCCAGACTCCGCTTCATCCCAAGCCTGA
I R Q H L K R V Q L R E L S E A E V R Q H R E A R P A L L T S R L R F I P K P D

CGGGCTGCGCGGATTTGTAACATGGACTAGCTGCTGGAGCCAGAACGTTCCGAGAGAAAGAGGCGGAGCGTCTACCTCGAGGGTGAAGGCACTGTTACAGCTGTGCTCAACTAGCA
G L R P I V N M D Y V V G A R T F R R E K R A E R L T S R V K A L F S V L N Y E

GCGGGCGCGCGCGCGCTCTGCTGGCGCGCTGTGCTGGGCTGGACGATATCCACAGGCGCTGGCGCACCTTCGTGCTGCGTGTGCGGGCCAGGACCGCGCGCTGAGCTGTACTT
R A R R P P G L L G A S V L G L D D I H R A W R T F V L R V R A Q D P P P E L Y F

TGTCAAGTGGATGTGACGGGCGGTACGACACCATCCCGAGGACAGGCTACCGAGGTCATCGCCAGCATCAAAACCCAGAACAGTACTGCGTGTGCTGCGTATGCGTGTGCTCA
V K V D V T G A Y D T I P Q D R L T E V I A S I I K P Q N T Y C V R R Y A V V Q

GAAAGCGCGCATGGGCACTGCGCAAGGCGCTTCAAGAGCCAC
K A A H G H V R K A F K S H

GTCCTACGTCCAGT
V L R P V

CCAGGGATCCCGAGGGCTCCATCTCTCCAGCTGCTCTGACGCTGTGCTACGGGACATGGAGAACAAGCTGTTTGGGGGATTCGGGCGGAGCGGCTGCTCTGCGTTTGGTGA
P G D P A G L H P L H A A L Q P V L R R H G E Q A V C G D S A G R A A P A F V G

TGATTTCTTGTGGTGACACTCACCTCACCCACGCGAAACCTTCTCAGGACCTGGTCCGAGGTGTCTCTGAGTATGGCTGCGTGGTGAACCTTGGGGAAGACAGTGGTGAACCTTCC

FIG. 11N



Altered C-terminus protein (ver. 2)

ATGCCGCGCTCCCGCTGCCGAGCGTGGCTCCCTGCTGCGCAGCCACTACCGGAGGTGCTGCCGCTGGCCAGCTGCTG
M P R A P R C R A V R S L L R S H A R E V L P L A T F V

CGCGCCTGGGCCCCAGGGCTGGCGGCTGGTCAGCGCGGGGACCGGCGGCTTTCCGCGCGTGGTGGCCAGTGCTGGTGGCTGGGAACGACGCGCGCCCCCGCGC
R R L G P Q G W R L V Q R G D P A A F R A L V A Q C L V C V P W D A R P P P A A

GGCTCCCGGGGTGGCGCTCGGCTGGGTTGAGGGCGCGCGGGGAACAGCGCATGCGGAGAGCAGCGCAGGCGACTCAGGGCGCTTCCCGCGAGGT
G L P G V G V R L G L R A A G G N O R H A E S S A G D S G R F P R R
A S P G S A S G W G * G R P G G T S D M R R A A Q A T Q G A S P A G
P P R G R R P A G V E G G R G E P A T C G E Q R R R L R A L P P Q V

CCCCCTCTCCCGCAGGTGCTGCTGCTGAAGGAGCTGGTGGCCGAGTGTGACAGAGGCTGTGACGCGCGCGGCGAAGAACGTGCTGGCCTTCGGCTTCGCGCTGTGGAAGGGGCGCG
P S F R Q V S C L K E L V A R V L Q R L C E R G A K N V L A F G F A L L D G A R

CGGGGCCCCCGAGGCGCTTACCACAGCGTGGCGAGCTACCTGCCCAACACGGTGACCGACGACTCGGGGGAGCGGGCGTGGGGGTGCTGCTGCGCGCTGGGGCAGCAGCT
G G P P E A F T T S V R S Y L P N T V T D A L R G S G A W G L L L R R V G D D V

GCTGGTTACCTGCTGGCAGCTGCGCGCTCTTTGCTGGTGGCTCCAGCTGCGCTACAGGTGTGCGGGCGCGCTGTACAGCTCGGCGCTGCCACTCAGGCCGCGCGCGCGC
L V H L L A R C A L F V L V A P S C A Y Q V C G P P L Y Q L G A A T Q A R P P P

AACGCTAGTGGAACCCGAAGGCTGTGGGATGCGAAGCGGCTGGAACATAGCGTCAGGGAGCGCGGGTCCCGCTGGGCTGCCAGCCCGGGTGGCAGGAGCGCGGGGCGAGTGC
H A S G P R R R L C E R A W N H S V R E A G V P L G L P A P G A R R R G G S A

CAGCCGAAGTCTCGCTTGGCCAGAGGCGCGCTGCGCTGAGCGGAGCGGACCGCGTGGGAGGGGTCTGGGCCACCGGGCAGGAGCGGTGGACCGAGTGACCG
S R S L P L P K R P R P R G A A P E P E R T P V G Q G S W A H P G R T R G P S D R

TGGTTTCTGTGGTGTCACTGCCAGACCCGGAAGAACCACTCTTTGGAGGGTGGCTCTCTGGCAGCGCCACTCCACCCATCGTGGGCGCGCAGCACACGCGGGCGCGCG
G F C V V S P A R P A E E A T S L E G A L S G T R H S H P S V G R Q H H A G P P

ATCCACATCGCGGCCACCGTCCCTGGGACACGCTTGTCCCCGGTGTACCGGAGAACAGCACTTCTCTACTCTCAGGCGCAAGGAGCAGCTGCGGCCCTCTCTACTCAG
S T S R P P P V Y A E T L Y S S G D K E Q L R R P S F L L S

CTCTGAGGCGCCAGCTGACTGGCGCTCGGAGGCTCGTGAGACCATCTTTTGGGTTCCAGGCCCTGGATGCCAGGACTCCCCCAGGTTGCCCGCTGCCCGCAGCGTACTGGCA
S L R P S L T G A R R L V E T I F L G S R P W M P G T P R R L P R L P Q R Y W Q

AATGGCGCCCTGTTCTGAGCTGCTGGGAACACGCGCAGTGCCCTACGGGGTCTCTCAAGACGCACTGCCCGTGGAGCTGCGGTACCCAGCAGCGGCTGTGTGCGCG
M R P L F L E L L G N H A Q C P Y G A E T L H C P L R A A V T P A A G V C A R

GGAGAAGCCCGAGGCTCTGTGGCGCGCCCGGAGGAGGACACAGACCCCGTGGCTGGTGGCTGCTGCGCAGCAGCAGCCCTGGCAGGTGTACGGCTTCGTGCGGGCGCTG
E K P Q G S V A A P E E E D T D P R R L V Q L L R Q H S S P W Q V Y G P V R A C

CCTGCGCGCGCTGGTGGCCCGAGGCTCTGGGGTCCAGGCACAAAGCGCGCTCTCTCAGGAACACCAAGAGTTCATCTCCCTGGGGAAGCATGCCAAGCTCTCGTGCAGGAGCT
L R R L V P P G L W G S R H N E R R F L R N T K K F I S L G K H A K L S L Q E L

GACGTGGAAGATGAGCGTGGCGGACTCGGCTGGCTGCGCAGGAGCCAGGGTGGCTGTGTCGCGCGCAGGACCGCTGCGTGAGGAGATCTGCGCAAGTTCCTGCACTGGCT
T W K M S V R D C A W L R R S P G V G C V P A A E H R L R E E I L A R F L H W L

GATGAGTGTGATCGTGGTGGCTGCTCAGGCTCTTTCTTTATGTACGAGACCAAGCTTCAAAAGAACAGGCTCTTTTCTACCGGAAGAGTGTCTGGAGCAAGTGTCAAGACATGG
M S V Y V V E L L R S F F Y V T E T T F Q K N R L F F Y R K S V W S K L Q S I G

AATCAGACACACTGAAGAGGTGACGCTGGCGAGCTGTGGAAGCAGAGTTCAGGACGATCGGGAAGCAGGCGCGCGCTGCTGACGCTCAGACTCCGCTTCATCCCAAGCCTGA
I R Q H G K R V Q L R E L S E A E V R E A R P A L L T S R L R L F L H W L

CGGGCTCGGACCGGATGTGAACATGGAATCAGTCTGGGAGCGAGACGCTTCCGAGAGAAAGAGGGCGAGCGTCTACCTCGAGGGTGAAGGCACTGTTACGCTGTCTCAACTACGA
G L R P I V N M D Y V V G A R T P R R E K R A E R L T S R V K A L F S V L N Y E

CGGGCGCGCGCGCGCGCTCTGGGCGCTCTGTGCTGGCGCTGGACGATATCCAGGGCGTGGCGCACCTGCTGCTGCTGCTGCGGCGCGGAGCCCGCGCTGAGCTGACTT
R A R R P G L L G A S V L G L D D I H R A W R T F V L R V R A Q D P P P E L Y F

TGTCAAGTGGATGTGACGGCGCGTACGACACCATCCCCAGGACAGGCTCACGGAGTTCATGCCAGCATCATAAACCCAGAACAGTATCGGTGCTGCGTATCGGTGGTCCA
V K V D V T G A Y D T I P Q D R L T I P Q D E T I A S I I K P Q N T Y C V R R Y I P K V Q C

GAAGGCGCGCATGGGACGCTCGGAGGCTTCAAGAGCCAGTCTTACCTTGACAGACCTCCAGCGGTACATGCGACAGTCTGTTGGTTCACCTGAGGAGACGAGCGCGCTGAGGGA
K A A H G H V R K A F K S H V S T L T D L Q P Y M R Q F V A H L Q E T S P L R D

TGCGGTGCTACGAGCAGAGCTCTCCCTGAATGAGCCAGCAGTGGCTCTTTCAGCTCTCTACCTGCTTCACTGTGCCACCAAGCGCGTGGCATCAGGGCAAGTCTTACGTCCAGTG
A V V I E Q S S S L N E A S S G L F D V F L R F M C H H A V R I R G K S Y V Q C

CCAGGGATCCCGAGGCGCTCATCTCTCCAGCTGCTGTCAGCTGTGCTACGGGACATGGAGAACAGCTGTTTGGGGATTTCGGCGGGAGCGGCTGCTCTGCGTTTGGTGGA
Q G I P Q G S I L S T L L C S L C Y G D M E N K L F A G I R R D G L L L R L V D

TGATTTCTTGGTGACACTCACTCACCACCGGAAACCTTCTCAGGACCTGGTTCGAGGTGCTCCCTGAGTATGGCTGCGTGGTGAACCTTGGGGAAGCAGTGGTGAACCTCC
D F L L V T P H L T H A K T F L R T L V R G V P E Y G C V V N L R K T V V N F P

TGTAGAAGAGGAGCGCTGGGTGGCAGCGCTTTTGTTCAGATGCGGCGCCAGCGCTATTCCTCTGGTGGCGCTGCTGCTGATACCGGACCTGGAGGTTCAGAGCGACTACTCCAG
V E D E A L G G T A F V Q M P A H G L F P W C G L L L D T R T L E V Q S D Y S S

CTATGCCGCGACCTCCATCAGAGCCAGTCTCACTTCAACCGCGCTTCAAGCTGGGAGGAACATGCGTGCAGAACTCTTTGGGGTCTTGGCGCTGAAGTGTACAGCCTGTTTCTGGA
Y A R T S I R A S L T F N R G F K A G R N M R R K L F G V L R L K C H S L F L D

TTTGAGGTGAACAGCCTCAGACGGTGTGACCAACATCTCAAGATCTCTGCTGACGCGGTACAGGTTTACGATGTGTGCTGACGCTCCCATTTTCATCAGCAAGTTTGAAGAA
L Q V N S L Q T V C T N I Y K I L L L Q A Y R F H A C V L Q L P F H Q Q V W K N

CCCCACATTTTCTGCGGCTCATCTCTGACACGCGCTCTCTGCTACTCCATCTGAAAGCCAGAACGCGAGGATGCTGCTGGGGCCAAGGGCGCGCGCGCTCTGCGCTCCGA
P T F F L R V I S D T A S L C Y S I L K A K N A E

CGAAGAAAACATTTCTGCTGACTCCTGCGGTGCTGGGTC
E E N I L V V T P A V L G S

GGGACAGCCAGAGATGGAGCCACCCCGAGACCGTGGGTGTGGGAGCTTTCCGGTGTCTCTGGGAGGGAGTTGGGCTGGGCTGTGACTCTCAGCCTCTGTTTCCCCCAG
G Q P E M E P P R R P S G V G S F P V S P G R G V G L G L *

FIG. 11S



CTATATATGAGTTTTTCAGTTTTGA

FIG. 11U

FIG. 11V

FIG. 11W